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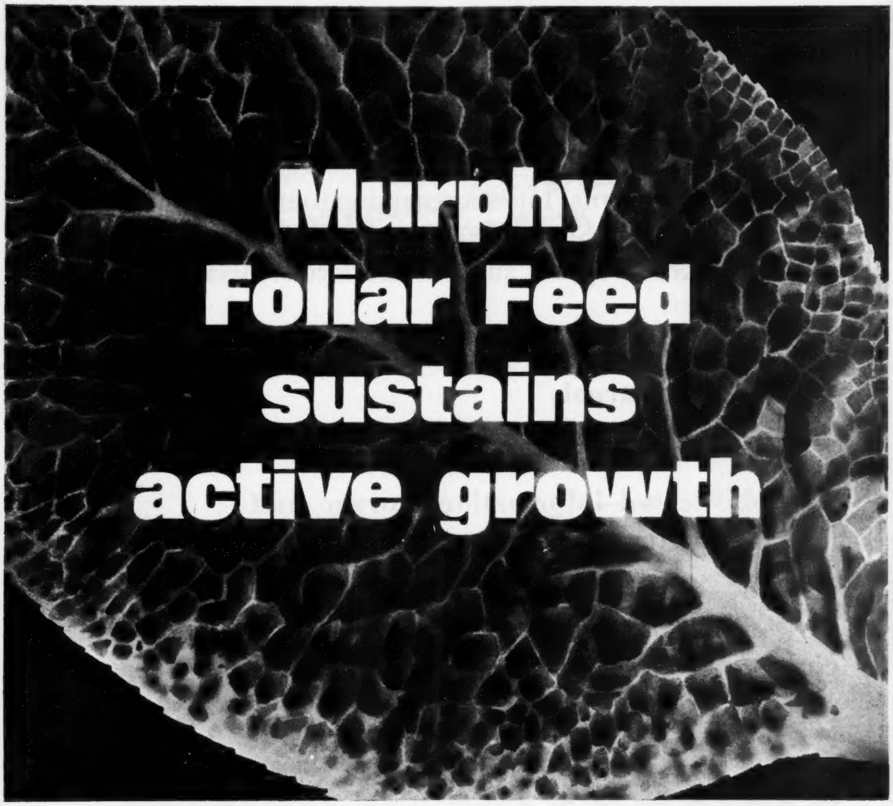

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Agriculture

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AGRICULTURE

MAY, 1968

The Rt. Hon.
Cledwyn Hughes, M.P.

Minister of Agriculture,
Fisheries and Food

A Message from the Minister to Readers of 'Agriculture'

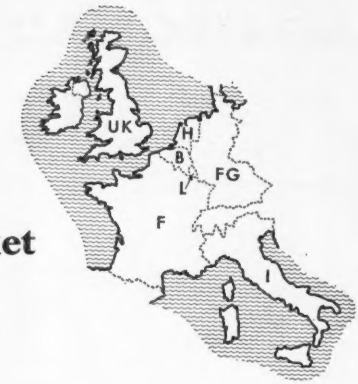
I take up my duties as Minister of Agriculture, Fisheries and Food at a time when technical developments and improvements continue to come thick and fast. I look forward to reading of some of these developments in 'Agriculture'.

My new Department has a very large interest in the dissemination of scientific, technical and economic advances. I shall certainly do all that I can to make sure that this is done efficiently and quickly. In this way we shall continue the remarkable progress of the industry for which I am now the Minister responsible.

Cledwyn Hughes

Pigs and Pigmeat

in the Common Market



R. C. Rickard

FIVE years have now elapsed since the first steps were taken to establish a common market in pigmeat throughout the E.E.C. During this period it was necessary to devise a transitional series of regulations governing the trade between member states. The need for a transition period was due to two interrelated factors. Firstly, wide differences existed before July, 1962, in the producer prices of pigs. Comparable prices in Luxembourg, for example, were more than 18 shillings per score dead weight greater than in the Netherlands. A price disparity almost as great existed between Federal Germany and the Netherlands. Secondly, there were considerable differences in the levels of cereal prices between member states, which were largely, though not wholly, responsible for the differences in producer prices for pigs.

During the transition period, levels of protection within the Community were progressively abolished. At the beginning, the levies on intra-Community trade consisted of two elements: one to take account of the differences in market prices and the other to compensate producers for varying levels in cereal prices between member states. Both elements have now been removed. The market or reference price difference was reduced by a certain fraction each year during the transition period until it ceased to exist on 1st July, 1967. The cereals price element of the intra-Community levy also disappeared on that date with the realization of uniform cereals prices throughout the Community.

The new regulations retain all the former protectionist characteristics regarding imports from non-member states or 'third' countries. The safeguarding of returns to pig producers within the Community is primarily secured by a system of levies, backed by minimum import prices and supplementary levies when the prices of supplies from third countries fall below the prescribed minimum import prices. It is unlikely, however, that the levy/minimum import price system will be sufficient in the future to curb excessive price fluctuations, particularly a severe fall in prices such as that which occurred in 1964/65. Therefore, a formal intervention procedure has been instituted with a basic price and an intervention price. This is a distinct departure from the earlier pig regulations which gave no indication of any intended price levels, target or minimum, within the E.E.C., although some form Community intervention procedure had been hinted at for some time.

The institution of basic and intervention prices has also meant that a method has had to be found of ensuring that the price quotations used for deciding whether support buying is needed are on a common basis throughout the Community. It then became necessary to establish common grading standards and a schedule of representative markets for use in determining market price quotations.

The undoubted complexity of the E.E.C. regulations for pigs and pigmeat arises from the fact that a very wide range of products is involved. However, they all bear some relationship, direct or indirect, to the one basic product—pig carcasses, fresh, chilled or frozen. In this article, the illustrations given will be related to this basic product. There are four main features of the regulations—the levy system, minimum import prices, restitution payments and market intervention. Each is dealt with separately below.

The levy system

The levy imposed at the common external frontier on imports from third countries is the principal means of protection afforded to pig producers in the E.E.C. It consists of two parts—a 'feed cost' element and a 'fixed' element.

1. The feed cost element is the difference between the cost of producing one kilogramme of pigmeat at E.E.C. and world market cereal prices. The E.E.C. prices used are the arithmetic averages of the monthly threshold prices for barley, maize, oats, rye and sorghum during the twelve months ending on 31st July, each year. The world market prices are the arithmetic averages of prices, c.i.f. (cost, insurance and freight) Rotterdam, for the same cereals during the six months preceding the quarter in which the levy is fixed. In arriving at the cost of each ration, the following weighting is used: barley 40 per cent, maize 20 per cent, oats 10 per cent, rye 20 per cent and sorghum 10 per cent. The difference between the cost of the ration on Community and world markets is multiplied by the factor 4·2, the deadweight feed conversion factor.
2. The fixed element is an amount equivalent to 7 per cent of the average minimum import prices during the year preceding 1st May.

The following example shows how the third country levy on pig carcasses for the period 1st July, to 31st October, 1967, was determined.*

	Per cwt	
	s	*d*
1. Weighted average cost of the ration at E.E.C. cereal prices	38	8
2. Weighted average cost of the ration at world market cereal prices	26	0
3. Difference in cost of rations	12	8
	Per score dead weight	
4. Food cost (difference in cost of rations × 4·2)	9	7
5. *Plus* 7 per cent of minimum import price	3	0
Third country levy	12	7

*Post-devaluation rates of exchange have been used throughout this article

The levy is calculated as from 1st July, each year. It can be altered at 1st November, 1st February, and 1st May, to incorporate changes in the prices of feed grains on world markets *only* if there is a change in minimum import prices at those dates. There was no change at 1st November, 1967 but the levies were raised at 1st February, 1968.

Minimum import prices

The system of minimum import, or sluice-gate prices, is essentially a means of supplementing the protection afforded by the operation of the import levies. They are a safeguard to prevent the under-cutting of the Community's internal price level by imports from third countries at abnormally low prices. If the offer price falls below the minimum import price, the Commission may fix a supplementary amount to be added to the third country levy. This supplementary levy is the difference between the offer price and the minimum import price.

The minimum import prices ensure that products do not enter the Community at prices considered to be below representative costs of production in third countries. They are determined in the following way. The first stage consists of calculating the cost of a standard ration. The average c.i.f. prices for the constituents are calculated during a period of six months preceding the quarter in which the minimum import price is fixed. The cereals are weighted as follows: barley 40 per cent, maize 35 per cent and oats 25 per cent. Additions are made in respect of protein and vitamin supplements, as well as transport and processing charges for cereals. A feed conversion of 5·46 : 1 is used to determine the food cost of producing one kilogramme of pig carcass. This is a deadweight conversion ratio which includes a share of the feed required to produce a piglet. Further amounts are finally added to cover the remaining costs of pig production, labour, housing, veterinary and medical, insurance, transport and marketing.

The calculation involved in determining the minimum import price for pig carcasses during the period 1st July, to 31st October, 1967, was as follows:

	Per cwt *s*	*d*
1. Weighted average price of cereals on world markets from November, 1966, to April, 1967	26	2
2. *Plus* 12 per cent of (1) for protein and vitamin supplements	3	2
3. *Plus* transport and processing charges	2	0
4. Cost of ration	31	4

	Per score dead weight *s*	*d*
5. Food cost (cost of ration × 5·46)	30	9
6. *Plus* labour, housing, veterinary and medical charges	9	10
7. *Plus* insurance, transport and marketing charges	3	4
Minimum import price	43	11

During the current year, the minimum import prices are effective from 1st July, but in subsequent years they will be calculated as from 1st August, each year and reviewed at the beginning of November, February and May. If there has been a variation of 3 per cent or more in the feed grain prices used in calculating the minimum import prices for the previous quarter, the new minimum import prices will be amended accordingly. If the feed grain prices have moved by less than 3 per cent, no change is made in the minimum import prices laid down for the previous quarter. No alteration was made at 1st November, 1967 but there was a reduction on 1st February, 1968.

Restitution payments

The basic principle of the system of restitution payments, or export refunds, is that member states should be enabled to compete on world markets and not be at a disadvantage because of higher prices ruling in the Community.

In the earlier regulations, a great deal of flexibility was permitted. The Commission laid down the maximum amounts which were permitted and individual member states could, if they wished, grant smaller refunds or even none at all. As from 1st July, 1967, however, the system has been made much more formal. A list of the products qualifying for restitutions and the amounts of the payment are published once a quarter and any changes as necessary are made and published within the quarter. It was originally intended that the amount of the restitution payment should represent the difference in the price of the particular product in importing third countries and in the Community. It has subsequently transpired that the methods employed in calculating the rate of payment vary according to various groups of products.

Three main methods of calculating the restitution payments are used, either alone or in combination with one another, namely:

1. The difference between the most favourable prices existing in third countries which are traditionally importers and the export prices ruling in exporting member states.
2. The incidence upon feed costs of the prices of feed grains on world markets compared with the prices of feed grains in the Community. This is equivalent to the feed grain element of the levy. It may be of interest to note that Wiltshire-type bacon, middles and backs are included in this category.
3. An amount equal to the levy on imports into the E.E.C. of the particular products or groups of products.

Market intervention

The establishment of a Community system of intervention, replacing the more informal methods by which member states were previously permitted to operate, is one of the main features of the E.E.C. pig regulations introduced in July, 1967. Intervention purchases, co-ordinated and financed by the Community can be made for certain main products.

Before 1st August, each year, a basic price for a pig carcass or side of a prescribed reference quality is determined. This price applies for one year beginning on the following 1st November, and is fixed at a level which is considered necessary to give stability to the market without the risk of over-production. When the average price of carcasses of a prescribed quality in the E.E.C. falls below the basic price and gives every indication of remaining at that level, an intervention price is declared. This intervention price

is between 85 and 92 per cent of the basic price. Until 30th June, 1968, the basic price is 55*s*. 6*d*. per score dead weight for B grade carcasses with minimum backfat measurements varying from 30 mm for carcasses in the 70 to 80 kilogrammes weight range to 60 mm for carcasses weighing between 140 and 160 kilogrammes. Price adjustments will be made for carcasses other than those of reference quality and products other than carcasses.

However, not all the issues relating to the establishment of a common market in pigs and pigmeat have been resolved. The most intractable problem, animal health restrictions on the free movement of animals and meat, still remains. National aids to agriculture vary considerably between member states, although considerable progress has been made in defining those which are compatible with the common agricultural policy of the E.E.C. and those which are not. Much, therefore, remains to be done. But from the standpoint of price policy, 1st July, 1967, has marked an important step forward in the organization of a truly common market for pigs, pigmeat and pigmeat products.

The author of this article, **R. C. Rickard, B.Sc. (Econ.)**, is a lecturer in the Department of Agricultural Economics, Exeter University. In 1966, he completed a study of pig production in various European countries for the Pig Industry Development Authority.

Grassland in Arable Farming

E. R. Bullen, *Director, Boxworth Experimental Husbandry Farm*

IT may seem inconsistent for a Husbandry Farm with less than 22 in. of rain per year, 70 per cent of its acreage in grain, and some notoriety for work on wild oats and continuous cereals, to concern itself with grassland. The justification for our interest lies in the fact that in the Eastern counties there is still a considerable grassland acreage, where farmers often tolerate the low returns per acre that we used to obtain from grassland at Boxworth. In 1967, the permanent grass acreage of the counties of the Eastern Region amounted to 560,000; in addition, 238,000 acres were returned as temporary grass.

Some of this 800,000 can hardly be regarded as part of any livestock enterprise; it includes, for example, land devoted to herbage seed and to red clover on stockless arable farms, or to crops for drying. Nevertheless, these acreages are not large and must be offset by 35,000 acres of forage crops, largely kale. If one converts the June livestock numbers into grazing livestock units (excluding pigs, poultry and barley beef), each unit required 2·1 acres in 1967. The figures for Boxworth a few years ago approached this level but the acreage has now been reduced to just over one per grazing livestock unit. If this were repeated in the region as a whole in theory twice as much stock would be carried or over $\frac{1}{3}$ million acres might become available for cropping. In practice, however, much of the permanent grass is not easily ploughable and some land is less suitable for grass than our clay.

In a logical world, one might have tackled various aspects of our problem of low grassland productivity by experimentation. This would have given a more factual basis to our opinions and, incidentally, made this article easier to write. But it would have imposed a time scale which we could not contemplate and demand resources that were not available. There was little information on some aspects of the problem relevant to our climate and soil, but of course a great deal was known from grassland work elsewhere, although few British workers had contended with such a dry climate.

We resolved to plough up a good deal of grass; to increase the use of nitrogen on what was left and to attempt better control of the grazing by extending and intensifying the paddock system we were using for cows. The management problems were simplified by the decision to dispose of our breeding sheep flock, which we could not in-winter, and by separating the grazing animals into three groups (cows, beef, dairy heifer replacements) each based on a different set of buildings. While this makes it difficult to use less productive animals as scavengers, at least one can be more certain of the amount of land devoted to each enterprise and the sort of return one has achieved.

Some years ago most of the grassland was in long leys, largely timothy/meadow fescue. With increasing stock density and use of nitrogen we have been changing over to ryegrass mixtures. About 100 acres is now more or less permanent, partly because of the reluctance of cows to walk far enough to

Nine months old heifers on permanent grass

take them around much of the farm, partly because poaching is one of the serious worries and partly because over 50 acres of our grass is not easily ploughable anyway.

We retain a certain amount in Italian ryegrass, for early bite and as a break crop, but about a third of our 'grass' is, in fact, legume leys—mostly lucerne/meadow fescue but including one-year red clover for hay and seed in some years.

Stocking density

The optimum stocking density, although one of the keys to grassland output, is very much an unknown under our conditions, but the following is a summary of our 1967 performance.

We allowed 0·8 acres to graze each dairy cow; we applied on average 350 units N per acre, and obtained 201 cow grazing days per acre up to 30th August. After allowing for some concentrates fed after turning out (mainly as a means of feeding calcined magnesite) the grass produced 380 gallons of milk per acre and in addition the surplus grass averaged 8 cwt hay per acre. It should be remembered that the dairy herd calves in the main between August and October and their performance from grass is necessarily less than could be expected from spring calvers.

We were rearing 64 dairy heifers last summer. The 30 first-year calves occupied 9½ acres and the 34 older heifers (in-calf to calve at 2 years) occupied 19½ acres. On average about 270 units N were applied per acre and the surplus grass yielded about 13 cwt hay per acre. In gross margin terms, if the down calving heifer is valued at £100 this amounts to about £60 per acre.

Our 18-month beef animals have been stocked at about 2½ cattle per acre; total liveweight gains have been about 600–650 lb per acre for each of the past four years, plus a certain amount of hay.

In 1967, we were on a short Italian ryegrass ley; this produced 602 lb liveweight gain, plus 17 cwt hay per acre; the cattle averaged 2·02 lb per day during the grazing period and, allowing for 350 units nitrogen and the costs of seed and fencing as variable costs, the gross margin is about £44.

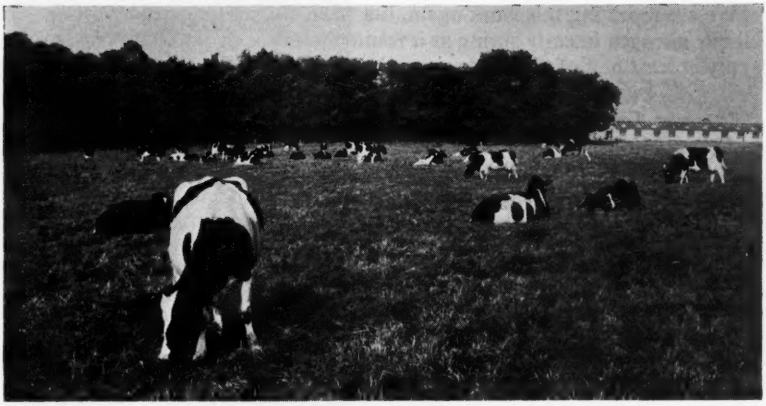
Our problems

Fodder conservation. We have based our winter conservation on hay, and now only make silage for experimental purposes; the small tower silo has been used recently for investigations of whole crop cereal silage.

While 'good hay, sweet hay hath no fellow' the land devoted to it is hardly productive even if one can average over 2 tons per acre as we would hope to. We can barn dry about 120 tons of hay, which enables reasonably 'good and sweet' hay to be achieved even in weather which is less than ideal. The extra costs, amounting to about £2 10*s*. per ton, are not negligible and the necessity to avoid putting too much hay into the barn at once can slow down hay-making, compared with the full speed ahead technique which is possible and more economic in settled weather.

Our studies in straw feeding, while encouraging one to think it is a method of reducing the acreage devoted to cows, do not so far suggest that it is necessarily a cheap way of producing winter milk. This depends of course on the relative prices of concentrates and milk, and the availability of labour to handle straw at a time when, like most arable farms, we are fully stretched.

How much nitrogen is economic. It is difficult to be precise about this beyond



Dairy cows paddock grazing Italian ryegrass

re-stating platitudes. About a third of the grass in arable areas received no nitrogen, according to the 1966 Survey of Fertiliser Practice. Farmers actually applied, on average, 84 units (temporary) and 69 units (permanent), to grass receiving nitrogen. What is justified on any individual farm depends on many factors like stocking density and managerial skill but the situation demands much higher levels than the Survey indicates.

We believe there is little reason at the moment to vary the policy summarized above, but this is one of the points where one feels the lack of experimental data.

When to apply. On average, by the end of June we have a 4 in. moisture deficit on our grassland and this is increased to 6 in. in late July and August. Nitrogen applied under these dry conditions gives uncertain responses, and we are keenly interested in the technique of applying much of the nitrogen in spring before a serious moisture deficit arises.

In the past two seasons we have compared a single application of 160 units nitrogen per acre in March with the same dressing given as an initial 40 units followed by 40 units after each of the first three grazings. The results were measured in the dry matter produced and as live weight gained by autumn-born Friesian heifer calves, stocked during 1966 at 2·45 calves per acre and in 1967 at 3·19 calves per acre. The results are summarized in the Table. It is interesting to note that although the total yield of herbage from paddocks which received the single dressing was less than that from the divided application, the cattle did better after the single early dressing in each year[1].

The effect of time of nitrogen application upon grassland productivity

Year	*Calves per acre*	*Units N*	*Digestible organic matter cwt/acre*	*Liveweight gain lb*	
				Per head per day	*Total for season*
1966	2·45	160 March	36·7	1·37	832
		4 × 40	42·2	1·28	741
1967	3·19	160 March	70·1	1·53	903
		4 × 40	74·5	1·38	819

Reference

[1]Clare R. W. (1968). The effect of time of nitrogen application upon grassland productivity under a paddock grazing situation. Animal Production 10 (in press).

We are repeating this work again, but have not yet felt prepared to apply all our nitrogen in early spring as a routine practice. We do, however, try to apply at least half of the total seasonal nitrogen by, say, mid-April.

Poaching. Even in a 22-in. rainfall poaching is a major problem on our heavy soil. Apaıt from the damage to the sward, particularly in gateways, this is a major reason for keeping the temporary ley acreages fairly low and for our not favouring strip grazing. This problem appears likely to become still more serious as we intensify further and increase our cow numbers above the present 100.

Problems which have not yet arisen

Refusing to graze contaminated swards was something we thought two or three years ago would worry us more than it does now. The young beef cattle have proved more fussy than either cows or heifers and topping has been more frequently necessary. With the 18-month beef enterprise one is, of course, aiming at much higher liveweight gains with this system than with heifers.

Husk has never been a problem at Boxworth and, when work on this disease was being done in the 1950s, artificial infection had to be used to avoid husk even in young susceptible cattle on permanent pasture.

We anticipated worms to be serious in the young 6–12 month heifers on permanent grass. So far, this has not arisen as a major problem. Possibly the dry summer, together with the long rest when the land is too wet to out-winter, explains why this has not been more serious.

Extension of the Market Development Scheme

The Minister of Agriculture, Fisheries and Food and the Secretary of State for Scotland have made an Order extending the Market Development Scheme for a further three years until March, 1971. (Market Development Scheme (Extension of Period) Order 1968 (S.I. 1968 No. 514)).

The Agricultural Market Development Executive Committee administer the Market Development Scheme on behalf of the three United Kingdom Farmers' Unions. It is the function of the Committee to consider proposals for assistance and to make recommendations to Ministers for grant.

Grants under the Scheme can be awarded for such activities as market research, grading and improvement of presentation of produce, and making the results of improvements known to producers.

Grants range from 25 to 75 per cent, and in exceptional circumstances may be as much as 90 per cent.

Up to 31st March 1968, 263 projects have been aided. Grants of £1,154,000 have been made towards estimated costs of £2,490,000.

The Agricultural Market Development Executive Committee's secretariat is being merged with the Central Council for Agricultural and Horticultural Co-operation, and the new address will be: Hancock House, Vincent Square, London, S.W.1.

Field Beans in Stock-feeding

A. Eden

IN recent years there has been renewed interest in the growing of beans for stock-feeding. This interest has been stimulated by the necessity for an economic break crop in continuous cereal growing, by greater efficiency in the control of weeds and pests affecting the crop, and by newer and higher yielding strains and varieties of both autumn- and spring-sown beans. Whereas a small proportion of the crop has been sold for export to the Continent, essentially the greater part is used as an animal feed, whether on the farm of origin, after sale to neighbouring farmers or to the feedingstuffs trade for compounding. Moreover, beans may be offered as a feed component to every class of livestock.

Unfortunately, until very recently, there has been very little interest by research workers in the nutritive aspects of beans, and practical feeding advice is still based on data obtained several decades ago. Where more modern figures have been quoted there is considerable doubt whether the 'beans' referred to relate to field beans, as are known in this country, or to more distantly related species (e.g., the 'lima' beans of the U.S.A.). Happily the position is changing, and within the next year or so there will be an appreciable amount of work undertaken to establish the true nutritive worth of field beans. The N.A.A.S. in the Eastern Region have been collecting and analysing samples of both autumn- and spring-sown beans for the past two years. Already our findings have shown that spring-sown varieties, such as Minor, contain on average about 4 or 5 per cent more crude protein and from 1 to 1½ per cent less fibre than typical autumn-sown strains. It must be appreciated that, as with all feedingstuffs, there is an appreciable range of values for each component around the mean in all varieties so that there is some overlap of figures. Taking all values so far obtained for all strains of beans examined we have found autumn- and

spring-sown beans at a standard moisture content of 14 per cent to show the following mean composition:

	Autumn sown		Spring sown
	%	(86% dry matter basis)	%
Crude protein	22·7		26·8
Oil	1·3		1·3
Crude fibre	7·7		6·9
Nitrogen-free extractives	50·9		47·6
Total ash	3·4		3·4
Calcium (Ca)	0·15		0·13
Phosphorus (P)	0·58		0·57
Potassium (K)	1·05		1·01
Sodium (Na)	0·01		0·005
Chlorides (Cl)	trace		trace
Magnesium (Mg)	0·12		0·11

At present there are no corresponding figures available for the digestibilities of the major organic components, but using the older digestibility co-efficients applied to these modern data we find that the overall assessment of the energy value of beans differs little from established figures, but spring-sown varieties are a little higher and autumn-sown a little lower in digestible protein content than the older figures suggest. At present, of course, this is conjecture and must remain so until modern digestibility figures are available, but in terms of practical feeding experience there is no reason to question seriously the very useful nutritive worth attributed to beans.

Nevertheless there have been reservations expressed that beans may not be as valuable as they are claimed to be. Some of these reservations, based on analogy with similar or related crops can neither be ignored nor lightly dismissed. Indeed, they are valuable as stimulants to further research into the properties of beans as stockfeed. They are concerned with (1) the length of time that beans should undergo in maturation after harvest before they are 'fit' or 'safe' to feed, (2) the possible presence of anti-trypsin factors influencing protein digestibility, as occurs in raw soya beans, with the corollary of the necessity to apply some appropriate heat-treatment before use, (3) the existence of factors in beans prejudicing their acceptability by livestock, (4) the incompleteness of bean protein as such, particularly its relative paucity in methionine and other sulphur-containing amino-acids, (5) the possible costive nature of diets containing beans. All these factors merit research attention and examination.

Feeding of beans to livestock was an old, well-established practice long before oilseed cakes and meals became available, and on many farms where beans have always been grown successfully this feeding tradition has been maintained. Modern techniques of combine harvesting have been introduced, with the result that 'new' beans are potentially available for feeding immediately after harvest. Before the introduction of the combine, beans were either pulled by hand or cut with the binder, shocked and stacked to await threshing in the late winter or spring, thus automatically ensuring a long period of maturation before feeding. Many of the older generation of farmers were neither willing nor in the position to feed beans of less than a year old (this practice is still occasionally met), whereas, in modern circumstances, the crop is available for feeding as soon as the beans have reached, or have been dried to, a safe level of moisture content for storage (usually under 16 per cent). This potentially denies them the older period

of slow maturation in the stack, and research is urgently needed to investigate what changes in the bean are involved in the process of maturation (a similar problem exists with 'new' grain). Tentatively beans may be considered to be safe for livestock feeding after the end of November, but there is no scientific proof as yet to lend support to this.

The possible presence of trypsin-inhibitors, such as occur in soya beans, which adversely affect the digestibility of the proteins in beans, needs more investigation, although the limited evidence so far available suggests that these inhibitors are either absent or present at very low levels. It is possible that this factor may be linked with the maturation problem already discussed.

Questions of palatability and acceptability by livestock of bean-containing diets are rarely seriously raised. It is well known that bean meal has a tendency to 'heat' in bulk and therefore no more than a week's supply should be prepared at a time. Presumably this heating is the result of micro-biological attack, and if the meal has gone slightly mouldy its acceptability by livestock may be prejudiced. There is no evidence to suggest that fresh bean meal when blended with other food exerts any deleterious effects on the diet, and from the point of view of animal acceptability bean-containing feeds are no different from those containing none.

Beans are alleged to have a 'costive' effect, but when used in feeds at normal and rational levels this effect is not generally apparent. The costive nature of a feed must take into account all the ingredients used in its make-up and general experience does not bear out the allegation.

The question of incompleteness of the amino-acid make-up of bean protein has to be looked at in relation to the remainder of the diet. Few foods are perfectly nutritionally adequate in themselves in respect of all nutrients, and the underlying principle behind all balanced diets is the blending of different ingredients in such proportions that the relative deficiencies in one are remedied by the others. Beans happen to be a very useful source of the amino-acid lysine, probably second only to soya bean in the general class of vegetable proteins, but at the same time they are appreciably lower in methionine and cystine contents, and these amino-acids have to be supplied by other components. There are weaknesses in all foods, and since most pig and poultry foods contain fish meal and other animal protein sources, the relatively lower content of methionine in bean protein is adequately met from other sources.

General feeding value

On the best evidence at present available the older figures for the overall nutritive value of beans are reasonably acceptable. In fact most people readily accept the 'standard' figures for beans used for ruminants and pigs, and it is only in connection with poultry that there has been a suggestion that beans are a poorer source of energy and digestible protein than their composition would indicate. This point is at present under investigation, and it is possible now to state that beans appear to have a nutritive value more in accordance with expectation and certainly very appreciably higher than some of the values which have been quoted.

In broad terms beans would appear to have an energy value and level of digestible protein that is intermediate between barley and soya-bean meal i.e., two parts of beans are equivalent to a mixture of one part each of barley-meal and soya-bean meal. This statement is subject to the limitations

of any general statement, but at least it gives a practical guide to the use of beans in a diet, that is beans can be substituted for soya bean by double the rate of usage of the latter with corresponding adjustment of the cereal fraction. Apart from some highly specialized turkey diets, the normal rate of usage of soya-bean meal in pig and poultry diets is between 5 and 12½ per cent, so that beans can be substituted in the range of 10–25 per cent.

In dairy production rations, beans have often been used up to a 50 per cent level of inclusion with barley (35 per cent) and oats or beet pulp (15 per cent). For the sake of variety some farmers prefer to use at least two sources of protein and a simple but effective dairy production mixture to be fed at 4 lb per gallon is:

8 cwt barley, 2 cwt soya bean, 4 cwt oats or beet pulp and ½ cwt beans, 2 cwt dairy minerals plus the usual small vitamin supplement.

Beans are not a good source of minerals generally, being low in calcium and very low in salt content, and in this respect they are similar to most cereals; hence in all diets for all classes of stock a level of 2–2½ per cent inclusion of mineral mixtures is necessary with further additional calcium for laying and breeding female birds.

Growing calves above three months of age have been successfully reared on a diet of cracked beans and hay, but such a feeding régime is usually insufficiently supplied with minerals and fat-soluble vitamins, and the use of a granulated combined mineral-vitamin supplement should be included with the beans to guard against deficiencies. Beans have been used with barley at a 15–20 per cent level of inclusion in the diets of intensively-fed beef animals, and they have the valuable property of producing a firm, white carcass fat. This property of beans is also in evidence where they are included at a 15 per cent level in the diets of pork and bacon pigs.

As already indicated beans may successfully be substituted for soya-bean meal in the diets of all classes of pigs and poultry, on average at a 15 per cent level. Where, as is usual, fish meal is also being included at a level of between 2½ and 10 per cent as the major source of animal protein there is little risk that there will be a limiting provision of any specific amino acid in a diet where beans are used in place of soya-bean meal. Details of such diets are best discussed in the specific context of the class of animal and the general availability of other foods, and it is not proposed here to do more than has been done to indicate the broad principles of the use of beans for such purposes.

Mostly, beans will be coarsely ground ($\frac{3}{16}$ in. screen) for inclusion in meal diets, but no more than a 4–5 days' supply should be ground before mixing owing to the risk of heating. For cattle and sheep beans are best fed cracked, although they are not easy to roll when thoroughly dry, hard and wrinkled. It has been claimed that up to a 2 cwt per ton rate of inclusion they can be successfully fed whole to cattle but more evidence is needed on this point. Feeding of whole beans to sheep and calves was once standard practice, although to what extent some escaped digestion and passed out intact does not appear to be recorded. On general principles it would seem advisable to give some form of mechanical treatment (cracking, rolling or grinding) before they are fed to any type of livestock.

This article has been contributed by **Dr. A. Eden, M.A., F.R.I.C.,** who is the Regional Animal Nutrition Chemist in the National Agricultural Advisory Service and is stationed at Cambridge.

Farm Waste Management

– Lessons from America

K. B. C. Jones

In January, 1967, I was lucky enough to be awarded a Kellogg Foundation Fellowship to visit the United States for six months. The purpose of my visit was to study methods of management, treatment and disposal for all types of agricultural waste. The term 'waste' is used in America in its broadest sense and this covers any material, liquid or solid, for which the farmer has no further use. Waste is a much better term than dung, effluent, manure or slurry, etc., which in the main describe the physical condition of a product rather than its source. On British farms today, and in the countryside generally, the disposal of plastic bags, bottles, glass, string and non-returnable metal containers is a very real problem, and these are waste just as much as dung and urine. There is also the difficulty of destroying residual wastes that contains unused antibiotics and metals after they have passed through the animal's digestive system.

Comparisons with U.K.

During my stay I visited 16 States, 20 universities, travelled about 12,000 miles on official tours and spent three weeks in Canada where I visited agricultural engineering workshops as well as private farms. The tour highlighted for me certain basic differences between farming in North America and Britain. The table below gives approximate comparisons of population, land acreage and the scale of the respective livestock industries as they were in 1965.

	U.S.A.	England and Wales
Approximate population	197m	48m
Area of agricultural land	2,300m acres	30m acres
Number of cattle	107m	9m
Number of pigs	53m	6m
Number of sheep	30m	20m
Number of poultry	377m	100m

At first sight, these figures may not mean very much, but put another way America has about 76 times as much agricultural land as England and Wales, and in terms of distance it takes a week to cross the States from east to west by road if a car travels eight hours a day and averages fifty miles per hour. Although the statistics initially indicate that America has an abundance of room to dispose of her wastes, her livestock industry in particular is centred

on relatively confined and highly populated parts, for example, the dairy industry around Los Angeles, beef and pig farming in the mid-western States and the poultry industry near New York and Rhode Island. In these areas, American legal, social and economic problems are very similar to those in Britain and there is tremendous pressure for land for domestic or recreation purposes, and farm wastes cannot be dumped where they will cause inconvenience or danger to others.

The current American legal position for the disposal of wastes appears to have been based on English Statute and Common Law. Farmers are not allowed to discharge wastes into rivers or watercourses, charges may be imposed in the rare cases where a public sewer is used, and private or public action can be brought for smell or nuisance interference. Rules for the storage or handling of manure adjacent to dairy buildings are very similar to the English Milk and Dairies Regulations, but my impression was that a good deal is left to the discretion of individual inspectors. This seems a good idea, as new methods are evaluated on the farm with selected producers before rigid rules are made. In Britain, we tend to delay acceptance of an innovation until it is proven, whilst in America farmers are encouraged to try new methods where there is no more than a calculated good chance of success. If the idea fails then the producer is naturally required to remove it.

In my experience, except on the North West Pacific Coast, American farmers have much less of a slurry problem with dairy cows than we have. The winters in the mid-western States, e.g., Wisconsin, are cold and dry and slurry is not the difficulty it is in the warm wet south-west of England. In southern California, the dairying areas are semi-desert and some of the largest units of perhaps 1,000–6,000 cows are kept on only 100 acres, and in areas with an annual rainfall of less than 10 inches. All the slurry from concrete areas adjacent to buildings can be scraped into paddocks for sun-drying either by spreading the material evenly on the ground, or by accelerated drying on a concrete pad with mechanical cultivators. There are exceptions, however, and one well-known group of farmers transport all their wastes to a central tip where the product is dried for sale. This set-up is hardly satisfactory, as the total output of manure exceeds buying demand for most of the year, and there is a perpetual legal battle over smells and nuisance complaints with local non-farming residents.

Life is certainly difficult for dairy farmers in the northern States where the winter temperature is often 10°F or more below zero and all manure tanks, fields and yards are frozen solid. It is not so bad, however, for the poultry and bacon producers whose stock are mainly kept indoors in insulated houses and where there may even be heaters.

Disposal of waste on land

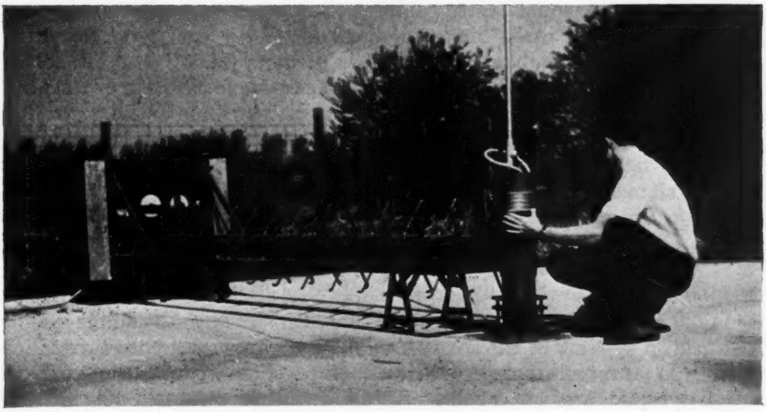
British machinery for pumping or handling farm waste is fully equal to anything I saw in America. Indeed, some British spreaders are made under licence and work very well under their conditions. Organic irrigation is difficult during American winters because of freezing temperatures, but is used in some areas for emptying cellars under slatted floor houses. Although this is an efficient way of performing the task, odour problems can be trying unless the slurry is first brought to an aerobic condition. Another idea that may have some relevance to Britain was at Pennsylvania State University, where experiments have been carried out with spraying partially treated

municipal sewage on to forest plantations. The operation has been carried out successfully, even under full winter conditions of 30 degrees of frost, provided a special type of brass nozzle is used several feet above the ground in the manner of a standpipe. I also saw experiments of sub-surface irrigation being carried out, where liquid wastes were discharged from a tanker into a furrow which had been opened by a cultivator—rather in the manner of a seed drill. Although this worked quite well, it was slow in operation and only possible when ground conditions were good. The purpose of covering the waste immediately was to try and eliminate odours and to prevent surface runoff to streams and watercourses.

Where the acreage of a farm is small and the quality of the land varies, there is a temptation during times of adverse weather to 'sacrifice' a few fields and load them with manure regardless of the physical damage to pasture or crops. Where smell, erosion or runoff is not a problem, this is satisfactory, but there is a real danger that toxicity will arise by the overloading of trace elements, e.g., copper, and substantial long-term harm done. The reduction of the soil to anaerobic conditions may also result in a partial or complete kill of earthworms, which loses a valuable means nature has of keeping soil in the aerated condition necessary for plant growth. Not a lot of research has been done in the U.S.A. into these aspects of land disposal, but they are conscious of the dangers and one or two projects are in hand.

I saw one or two units where manure was dried for sale to domestic or market gardeners. Cow manure with a minimum analysis of 1 : 1 : 2 N.P.K. was selling retail in Seattle supermarkets at $2·95 per 50 lb bag. This is far more than the product is worth, but good advertising techniques are keeping the short-term market steady. The farmer receives about $1·75 for the bagged material at the farm and the remainder is the margin to the retailer. The market is insufficient for anything other than a small number of producers, and farmers who had dry manure for sale were using converted rotary oil-fired or natural gas grass driers for this purpose. Dried poultry manure has a much better N.P.K. analysis as well as a lower initial moisture content, and one wonders how long dairy manure can continue to command a market.

Rotating mechanical cultivator to assist sun-drying of poultry manure



Treatment of waste

Intensive units with little land require industrial or commercial type plants to treat their waste. In most cases, these provide for the separation of solids and liquids, the former being dried or biologically stabilized and the latter purified by filtering and aeration until clean enough for discharge to a stream or watercourse. Some years ago, it was hoped that this process might be achieved by natural means in lagoons. Optimists hoped that the whole process could be aerobic, and others envisaged a combined anaerobic/aerobic system with two ponds or one big one divided into sections. Both were disappointing and I have seen no simple lagoons dealing with farm waste that have proved capable of digesting a reasonable volume of solids for an extended period. Without mechanical or chemical assistance, it is generally impossible to control odours, and the pond would require de-sludging at intervals.

Poultry manure—an overloaded lagoon

Anaerobic digestion can be improved by heating the sludge to 95°F but this is uneconomic and gives unpleasant odours unless it is in a sealed chamber. Aerobic stabilization is improved by any means that adds dissolved oxygen to the water. The Pasveer type ditch, floating aerators, simple mechanical pumping or sophisticated compressed air equipment, all prevent odour concentrations and assist biological breakdown. Air can be mechanically pumped into water at about 3 lb 0_2 per h.p. per hour (at 68°F and a dissolved oxygen content of zero) and I see a promising future for assisted or extended aeration, as a means of both conditioning and treating farm waste. An example would show what this means in terms of animal numbers and, using American figures, the following might be typical oxygen requirements for various classes of animal waste:

Dairy cows (1000 lb live weight) approx. 1·5 lb of 0_2) per day.

Pigs (130 lb live weight) approx. 0·5 lb 0_2 per day.

Beef animal (1000 lb live weight) approx. 1 lb 0_2 per day.

In my experience, except for the specialist Pasveer ditch, Britain is leading the field in systems of extended aeration. American research on oxidation ditches so far reveals them as valuable tools to 'condition' waste and prevent it going septic, but not capable of dealing with concentrated effluent with

high concentrations of solids. Floating aerators rely on throwing effluent up into the air in the manner of a fountain, and this method is successfully used to prevent all types of waste going septic. By itself it could probably, in the long run, biologically stabilize concentrated farm waste, but very lengthy detention times would be required and the volume of waste to be dealt with on a typical farm would make this uneconomic.

Planning to reduce the waste problem

Management is a vital part of farming, and good planning as well as tidy work is essential in dealing with waste. Many 'problem' farms, on examination, are found to be ones where the impossible has been attempted, or where an insufficient effort is being made to cope with the waste produced. It is useless to develop large livestock units adjacent to residential areas where land is heavy, and there is no reasonable chance of avoiding smell nuisances or complaints from slurry tanks or heaps. The Americans, in southern California, have partly solved this problem by designating areas of land as dairying districts on their town planning maps and no non-agricultural development is allowed within these limits. This seems an excellent idea, as it is the indiscriminate mixing of good class residential houses and commercial livestock units that has led to so much difficulty in Britain.

In actual farm building design, the Americans have not a lot to teach us, and ceiling-suspended battery laying cages for poultry are probably the only completely new idea that I saw. These work very well indeed, and make the removal of manure by either mechanical scraping or hydraulic action much easier. Slurry removal from dairy units is much the same as in Britain, with tractor scrapers, underground tanks and loading ramps, etc., to be seen on most farms. Pigs are in slatted or semi-slatted houses and little bedding is used.

At Iowa State University partially treated pig effluent is used to wash down the dung passages of a Danish type house by an intermittent discharge from storage tanks. Approximately 5,000 gallons per day is discharged into the two channels of a house holding about 700 pigs. The system works very well and it is never necessary to scrape the passageways at all. At first, the pigs enjoyed playing in the flowing water in the channel, and some must have acquired the habit of drinking this water instead of using the proper bowl as they suffered digestive upsets, which necessitated temporarily stopping the practice. However, this difficulty has been overcome and no major snags remain.

Trends in research

The Americans have a tremendous programme of research into waste management and at present are spending about £350,000 per annum. This programme covers all aspects of mechanical and agricultural engineering, also the biological and sociological factors connected with waste disposal. Of particular value is their proposed work to determine the physical, chemical and biological properties of animal waste, and how it varies with the age, sex, feed ration and environment of the animal. Until the exact content of farm waste is known, it is difficult to obtain advice regarding treatment techniques from public health engineers, who themselves may know nothing of farming. This situation is very similar to that in Britain, and it is necessary for our communications to improve in this field. Possibly, America has marginally better communications in this area than we have, because they recognize

that agricultural engineering covers more than just machinery, and the province of the engineer includes all types of farm structures. The University Degree of Bachelor of Agricultural Engineering normally includes courses in hydraulics, public health engineering and farm structures.

Smell is a big problem with farm effluent, but very little is known of its cause, measurement or control. The offensive smells from farm waste is mostly hydrogen sulphide and the mercaptan gases. I have found nobody who can quantitively measure these gases in the small concentrations that are sufficient to offend the human brain. Some basic research is vital in this field, but at the moment none is in hand either in America or Britain.

Non-degradable waste, e.g., metals, plastic, glass, etc., is a nuisance to farmers and often has to be buried. The Americans use deep trenches dug with a bulldozer for this purpose, and call them sanitary land fills. The principle is that a long trench is dug out perhaps 60 ft long, 20 ft wide and 12 ft deep, and the waste is tipped into one end. After levelling, each loading of waste is covered with a layer of soil from the pile alongside. By this means, smell is overcome, fly and rodent trouble eliminated and the dangers to public health minimized. A dry site must be chosen, and care must be taken not to contaminate water supplies in underground strata. This type of tip is in common use for municipal refuse, but I have not seen them used on English farms.

Composting is a well-known garden process of aerobic decomposition, and the end product is a biologically stable compound of value to gardeners and horticulturists. Undoubtedly municipal household garbage contains material which, if it can be recovered for a reasonable price, is both contributing to national output and overcoming a problem. Intensive research is on hand in America and Britain to develop this process.

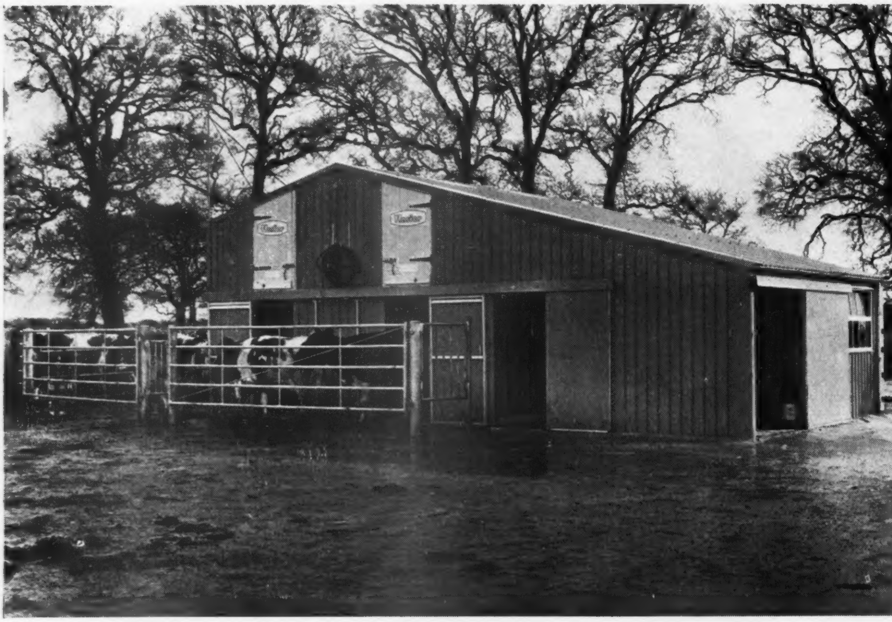
In general, the next decade promises to be one of great challenge to those concerned with farm wastes. The problems are clear, and it only remains for finance to be made available for research, and for the workers concerned with the various problems to co-ordinate in carrying out and reporting on their programmes.

This article has been contributed by **K. B. C. Jones, B.Sc., A.R.I.C.S.,** who is a Senior Assistant Land Commissioner with the Agricultural Land Service in London. He was awarded a Kellogg Foundation Fellowship to visit the U.S.A. in 1967. He has a special interest in farm waste disposal and its effect on building design.

New Council for Small Industries in Rural Areas

The Development Commission announce that they have set up a new organization called the Council for Small Industries in Rural Areas (CoSIRA).

The Commissioners have for some time seen need for a new outlook and approach to the problems of small industries in rural areas, including country towns. The Council, which will exercise executive functions, will integrate the organizations and staff at present serving small industries in England and Wales. As a beginning, the Council took over, from 1st April, 1968, the responsibilities and staff of the Rural Industries Bureau and the Rural Industries Loan Fund, and will thus assume control nationally of the advisory, training and credit services hitherto provided by these two separate organizations.



Farm Buildings

A modern pre-fabricated milking parlour.

This feature on the subject of farm buildings and their preservation contains articles by

★ **J. D. Young, B.Sc.** (Estate Management), Lond., A.R.I.C.S., a Senior Assistant Land Commissioner with the Agricultural Land Service. In October, 1967 he was appointed Liaison Officer at the Farm Buildings Centre, Kenilworth.

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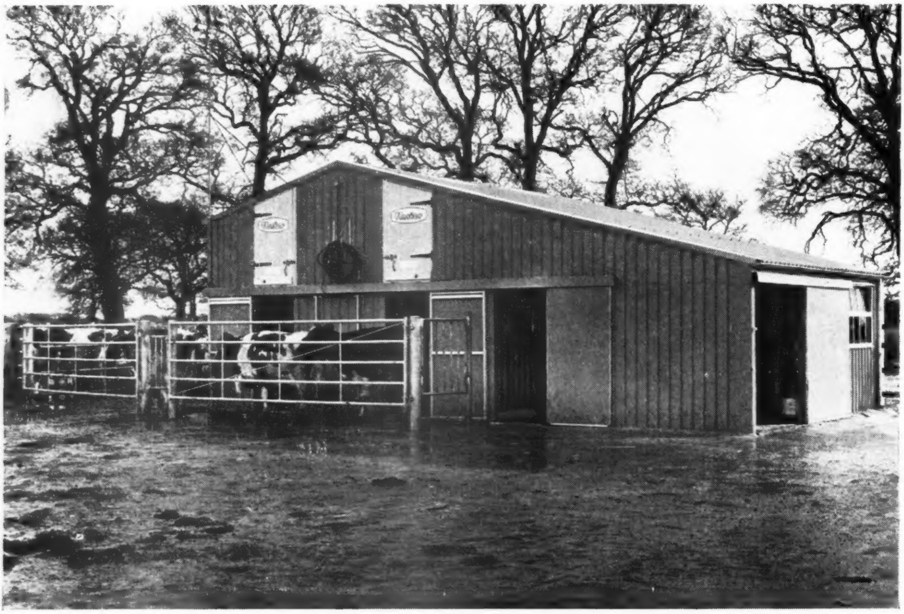

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Farm Buildings Today

J. D. Young

THE steady advance in farm building design is rarely punctuated by startling developments and this may be said of progress in agriculture generally. New ideas are introduced, receive great publicity and are hailed as the long-awaited answer to a particular problem. Some fail completely but the majority take their place along with more traditional methods to maintain the ever-increasing efficiency of British agriculture. The last two or three years have seen a growing awareness of the need for sound, maintenance-free, low-cost farm buildings which either have a short material life or alternatively can be readily adapted to changing techniques. The importance of adopting an effective costing system for investment in farm buildings is at last accepted and the rate of future progress in building design techniques will depend on their ability to reduce costs. A reduction in cost is not necessarily a reduction in capital cost and low-cost buildings have too often been confused with cheap buildings.

Modern farm buildings fall into three main categories:

1. The specialist pre-fabricated building which is marketed as a 'package-deal' and often includes equipment.
2. The portable building with a short structural life and low initial cost.
3. The large-span 'umbrella' building with a long structural life and low maintenance cost.

There have been developments within each of these categories and a noticeable trend towards a sharper definition between them. It is not many years since the majority of farm buildings were erected with concrete block walls supporting an asbestos or 'galvanized iron' roof, and framed buildings of over 40 ft span were considered unusual. Often the internal partitions everywhere were of the same concrete block which could be removed only with great difficulty at a risk of bringing down the whole building.

The specialist building

The development in these buildings has been primarily for the housing of intensive pig and poultry enterprises. The buildings are prefabricated, generally in timber, delivered to the site in sections and quickly erected on a prepared base. They are available in a limited number of standard sizes and are now considerably cheaper than a purpose-built building to house a similar enterprise. The timber is treated by modern preservative and there is

little maintenance to be done on the building. The structure is well-insulated and in most cases mechanically ventilated. The fans and control equipment, together with all internal fittings, are sold with the building. The specialist producer has little time for shopping around for all his equipment and by accepting a degree of standardization he obtains value for his money.

This trend has also been developing in the dairying industry. The cow kennel, which began life as a low-cost, short-life building, has become more sophisticated and is being marketed as a complete housing and feeding set-up for a dairy herd. The use of rectangular hollow section tube supporting the roof from the cubicles has enabled the price of cubicle sheds in steel to be reduced to a level not greatly in excess of the timber kennel. Milking parlours are now being delivered to the farm ready for bolting to a concrete base. These units, some of them developed from the portable milking bail, include all the milking equipment, cake storage and sometimes a dairy as well. They are cheaper than those built in traditional materials and often as cheap as the conversion of an existing building. Although they may have a short structural life this is no disadvantage as the technological advance in dairying is so rapid that few parlours are efficient for more than eight or ten years.

For grain storage the 'package-deal' building is becoming increasingly popular. In a bin storage installation the price may include: bins, roof, perforated floor, tunnel, top and bottom conveyors, fan, heater, cleaner, elevator, pit lining and switchgear. All the customer has to provide is a level site, a suitably reinforced concrete raft, a hole for the elevator pit and an electricity supply. Although such buildings are expensive, they are fully automated and the advantage of a 'package deal' during the planning and erecting stage is immense. 'On-the-floor' stores are increasingly being marketed as buildings complete with all the equipment. Recent developments in this field include the single-duct store, pioneered by James Rainthorpe in Lincolnshire, and the self-emptying store with a perforated metal floor. Although both in their infancy, one can foresee an increasing number of single-duct stores being erected by the large grain producer, and the self-emptying store may have most of the advantages of a bin system at a lower cost.

The short-life building

The last few years have seen a never-ending quest for the 'cheap' farm building and this trend will undoubtedly continue although there is still much confusion as to what is really wanted. Before outlining some of the recent developments in this field, it is necessary to clarify one or two points. Firstly, the best building for a farmer is the one which will give him the highest return on his capital investment. It may be necessary, in certain circumstances, to seek a building with a low capital cost, but it should be realized that such a building may not necessarily be the best investment over a period of years. Secondly, many of those who preach the doctrine of cheap buildings and who have been the pioneers in this field have aimed solely at low capital cost and have ignored the annual cost. Thirdly, many low-cost buildings have used traditional materials badly and achieved savings by ignoring sound building practice. Such buildings may seem cheap until the one year in seven when they collapse on top of 300 ewes and lambs under a heavy snow-load.

Nonetheless, there have been great advances in this field and there will be many more now that new materials are becoming available in the agri-

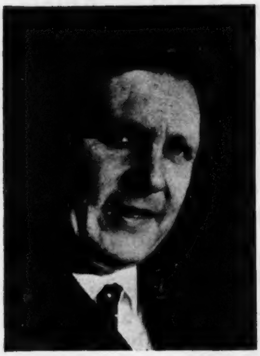
cultural building field. Plastics have an undoubted future in low-cost building and a number of plastic sheds have been erected, mainly for sheep, with varying degrees of success. The plastics used so far have not been strong enough and some of the structural frames have not been sufficiently stable. But a strong plastic sheet on a sound frame is sure to find a place on many farms, especially as temporary cover. Such a building however needs to be erected on a sheltered site as otherwise the sheets may soon tear and blow away. It must also be capable of being quickly erected and dismantled. We have not yet seen the true portable building but if it can be produced at an attractive price it will be in great demand.

New designs of steel sheets, especially the high-tensile galvanized sheet and the deep-profiled sheet are opening new fields for low-cost buildings. These sheets are lighter and stronger than the traditional sheets and apart from being cheaper per sq. ft covered, they require less support and the cost of the frame is therefore reduced. The use of oil-tempered hardboard is growing and this is an ideal material for the portable building, being light, tough and weatherproof. For the really cheap portable building, the straw bale has few rivals. But when in proximity to other buildings, the fire hazard should be considered.

The umbrella building

The concept of the umbrella building is not a new one and there are many who consider that there is no longer a place on the modern farm for the long-life building. This may be true of the intensive stock farm and specialist factory farm but the majority of farms in this country still have inadequate and out-of-date fixed equipment. On such farms a new long-life building will increase the value of the farm as well as give ideal cover for a variety of enterprises. Provided the building is sufficiently large and has few internal columns it is likely to remain useful for up to 50 years. The majority of old buildings that are structurally sound still provide valuable cover, even though they are not ideal, and there is no reason why an umbrella building erected today should not be useful in 50 years from now.

Timber, steel and concrete are used for the main framework and each has certain advantages and limitations which are well known. Asbestos cement sheets are still favoured for roofing and the deep profiled sheet is becoming increasingly popular for roofs with a lower pitch. Steel sheets are now being manufactured in greater lengths and recent techniques of bonding plastic and other materials to steel have produced sheets that are maintenance-free and in attractive colours. These developments mark a revival of interest in the use of steel sheets for roofing. Aluminium sheets are rarely used outside specialist buildings, but their use in roofing and cladding is likely to increase. The same materials are used for cladding with the addition of timber space boarding which is rapidly becoming accepted as the most suitable cladding material, above wall level, for cattle housing. Spans of up to 100 ft are now not uncommon and the initial cost of such a building, without cladding and walling, is still under 10*s*. per sq. ft. Moreover, the annual cost of such a building when depreciated over 20 or 25 years compares very favourably with the annual cost of many cheap buildings. The building provides good working conditions for the farmer and his men, protection from the elements and, when properly designed and constructed, an attractive and lasting asset to the farm.



Protective Paints for Farm Buildings

L. Woodhams

It has been estimated that the construction industry spent £1,000 million on maintenance in 1966 and occupied 40 per cent of its labour force. It would be reasonable to assume that a considerable proportion of this was painting or similar work designed to protect against corrosion, erosion or decay.

We all readily acknowledge the cost and worry of maintenance but, unfortunately, are not always encouraged to make the initial specification worth while in terms of performance and cost in use. This is not to infer that high capital cost is inevitable. An examination of steel Dutch barns erected 60 years ago shows that the need to protect steelwork is not always required. Many such barns are still good and those that have corroded have more than paid for themselves and will not impose restrictions on re-planning exercises. There are, however, areas in and about agricultural buildings where the maintenance of structure or surface is essential and where specification, other than 'knot stop prime and paint', should be considered.

Types of paint

Traditional paints consist of a pigment held in suspension in a medium (also called the vehicle) and dry partly by evaporation and oxidation to a solid film. The medium is the film former and is principally responsible for the characteristics of the paint; for example, glue/water solutions are used for size distempers, cellulose solutions for quick-drying lacquers, natural or treated vegetable oils for oil paints, alkyd resins for hard gloss paints. Some of the newer 'two pack' paints, that is those which are supplied as separate components and must be mixed together immediately before use, do not rely solely upon evaporation and oxidization to form a film. Instead, a chemical process changes the structure of the liquid to a solid.

For paints to dry by evaporation, it is essential that coats should be thin and that sufficient time elapse between coats. Each coat of traditional paint gives a thickness of about 0·002 in. and as it is considered that not less than 0·005 in.—0·007 in. is necessary to provide reasonable protection to iron

and steel a three-coat system is, therefore, essential. With solvent type epoxy resins, the same conditions apply, thin coats to allow the solvent to evaporate, but the solvent-free formulations allow thick coatings up to 0·01 in.—0·015 in. to be applied.

Corrosion and preparation of ferrous metals

The protection of iron and steel is a major item of maintenance, and an understanding of corrosion is worth while in considering a painting specification. Ferrous metals corrode by an electro-chemical process which is set up by the presence of moisture. The moisture acts as a bridge or 'electrolyte' for the flow of ions from the anodic to cathodic areas, and the corrosion takes place in the anodic part.

If, therefore, ferrous metals could be permanently protected by an impervious film corrosion could not take place, also if a permanently anodic layer be formed then this would sacrificially corrode and protect the base metal.

Preparation of ferrous metals for painting may differ for new and old work and also for the painting system to be used.

Much of the steel used in agriculture is 'hot rolled' and in this process acquires a layer of iron oxide or 'millscale' which is not continuous. Within the factory, steel can be prepared for painting by being shot blasted, which leaves the metal clean and bare. Except for large areas, such as ships bottoms, this process is generally not feasible for *in-situ* members. Pneumatic needle heads which pick at the surface are available, but naturally demand heavily on labour. Other factory methods include the 'pickling' type, where the metal is immersed in sulphuric, hydrochloric or phosphoric acid which 'eats' away the millscale and rust. Neutralizing is an important operation after these processes before subsequent painting.

A very common practice is to expose the steel to weather until the millscale is loose and then clean by wire brushing; even where mechanical brushes are employed this is not a very satisfactory process.

Records show that paint will last four to five times longer on blasted or pickled surfaces than those which have been hand cleaned and one source quotes the relative costs of preparation, painting and maintenance over 50 years as: blasting 1·0; pickling 1·25; weathering and wire brushing 2·5; if allowances were to be made for increasing costs then these figures would probably be even more in favour of blasting.

Preparation for repainting of existing painted steelwork depends much on the condition of the old paint film. A good rub down with wet and dry abrasive paper with warm water and detergent is good enough for a sound film. But where it is flaking or blistering, all loose paint should be removed by chipping, brushing, scraping, or blasting, if possible. Areas of sound paint should have their edges smoothed off to allow an easy flow for subsequent coating.

Zinc rich primers

These anti-corrosive coatings contain approximately 95 per cent zinc. To obtain full 'sacrificial' protection, the coating must have continuous contact with the ferrous substrate; thorough preparation is therefore most important. Pre-treatments containing phosphoric acid which leave an electrically insulating film should not be used.

The coating has good resistance to rust creep where the substrate is made bare and has particular application for 'touching up' galvanized material.

Micaceous iron ore paint (micaceous iron oxide)

This is a 'water barrier' and has little or no rust inhibiting qualities. The ferric oxide pigment, which has been crystallized and pressed by subterranean action into a plate-like form, builds up to some 20 layers of interleafed particles in the paint film. Used with a rust inhibiting primer, it provides a good basic system for the protection of ferrous metals.

Magnetite treatment

Apart from the priming paints, there is a treatment based on the theory that rust can be converted/reduced by electrolytic action to magnetite. The film when formed is claimed to be insoluble and irreversible, checks rust creep where the film is broken and is impermeable.

Preparation demands getting down to a 'clean' rusted surface, but it is claimed that blasting is not essential.

Chemically resistant coatings

Failure of normal paint systems is most often due to faulty preparation, inadequate film thickness or inter-coat dampness rather than aggressive atmospheres. But there are conditions where a traditional paint would prove inadequate and an appropriate special system should be specified.

Chemically resistant paints in themselves do not necessarily infer an overall superiority, particularly as they are less tolerant of poor surface preparation. Various metals usually require blasting but if pickled, care must be taken to remove and/or neutralize the rust removing agent.

New concrete surfaces must be cleaned of loose, flaky and powdery material; old surfaces usually have a build-up of dirt and grease and need mechanically abrading to get back to a clean surface, but the penetration of grease is best tackled with a 10 per cent solution of hydrochloric acid left on for 10 minutes and then well washed down with clean water.

The use of some of the newer paints may call for special techniques in handling and application and this may involve the training of operatives. Due regard must always be paid to manufacturers' instructions which may call for protective clothing to be worn and special care to be taken when used in confined spaces. Solvents in some of the painting systems have toxic qualities.

Special paints should only be used when it is known that normal paint systems will be unsatisfactory and the specifier is aware of the performance requirements of the material to be used.

Chlorinated rubber paint

Where improved resistance to weather, water, acid and alkali than is offered by most high gloss paints is desired, chlorinated rubber is always worth considering, especially on alkali surfaces such as cement rendering, brickwork and asbestos cement sheeting. It has good adhesive qualities, together with marked resistance to scrubbing and mould and bacteria attack. There is a tendency for the material to 'pick up' on subsequent brush applications which demands skill of the operatives to achieve full build of second coats; spraying overcomes this problem. Normal chlorinated rubber paints

tend to provide thin coatings and are prone to pin holing but 'high build' formulations improve their characteristic in this respect.

Epoxy paints

Apart from the epoxyester paints, these are two-pack materials, the resinous material in one can and the 'curing agent' in the other. Proportioning of the materials is critical and clearly stated in the manufacturers' instructions.

When mixed, the material will start to cure and must be used within the 'pot-life' period. Temperature is important to the curing process and figures of seven days at 12°C to only four hours at 50°C are quoted for the material to completely cure and achieve full chemical resistance.

The chemical resistance of the film can cause problems of inter-coat adhesion, subsequent coats should be applied before the first coat has completely cured to allow the solvent to chemically weld the coats together.

Film thickness is not great and four coats may be required to give 0·005 in. thickness. Recent developments have produced the solvent free materials having high build qualities. Single coats of 0·009 in. can be applied.

Surface preparation and application technique, although of great importance, are not beyond the capabilities of skilled farm labour.

The combination of epoxy resin with coal tar or pitch has produced a most useful coating material having good water, chemical and heat resistance with a tolerance of really hard wear.

Urethane paints

Perhaps the most general knowledge of urethane paints is their application to timber floors and work tops and in clear finishes (varnishes) where their improved resistance to ultra violet light (which means better weathering qualities) and to water and weak solutions gives them advantages over many traditional materials.

As a coating material to meal bins their 'release' qualities, which discourage the build-up of crust, can be exploited.

Choice of system

This article cannot possibly be exhaustive of paint characteristics let alone of kinds. Limited mention can only be made of the emulsions where acrylics produce a paint which can be re-coated in 30 minutes and used as undercoating for gloss paint as well as a wall finish, of the fire resisting and thixotropic paints or the other many special purpose materials that are available.

Experience and knowledge of special paints are probably limited to manufacturers and professional people interested in the subject, but advice is freely available and always worth taking.

With the general advance in industrial techniques new materials are sure to be developed, not only for existing situations but also specially designed to meet new conditions which are sure to arise.

It is fairly certain that increased use of 'synthetic' materials will be made but whether the traditional way of applying liquids to provide solid film protection will continue is open to conjecture.

Reference to lead based paints has been deliberately omitted from this article; the pigment has a toxic character and veterinary opinion is against its use on the farm.

Prevention of Enteric Diseases in Calves

Individual penned calves at Throws Farm, Dunmow, Essex

J. A. Norman

SURVEYS over Britain show that the wastage of calves born alive is between 5 and 6 per cent. Within this figure the number which die and the number which are culled are roughly equal. Enteritic disease accounts for between 40 and 50 per cent of the losses, or an annual loss to agriculture of £1,000,000.

Many of the organisms involved in enteric disorders are normally present in the intestines and, although certain strains are capable of causing disease, their virulence is low. It is necessary for some factor to be present which weakens the animal and allows the organisms to multiply and invade the tissues. Once this has happened under conditions of intensive husbandry the infective agents build up on the site and overwhelm the resistance of healthy stock, leading to the development of epidemics.

The prevention of enteric disease involves the adoption of measures of husbandry that ensure the minimum interference with the development of a high degree of resistance by the calf under conditions which prevent the build-up of high concentrations of infective organisms.

Nutrition of the dam

The condition of the calf at birth and the level of reserves of minerals, vitamins, energy and protein plays a vital part in its future development and freedom from disease; this is related to the plane of nutrition of the dam, particularly during the last two months of pregnancy. The system of milk production has a bearing on this in the case of dairy calves; feeding for high yields usually involves some degree of steaming-up at the end of the dry period, whilst low-cost production, if it involves the maintenance of the dry cow on a very low plane of nutrition, permits deficiencies inherent on the farm to be passed directly to the calf. Copper and iodine deficiencies which occur in certain areas and in poor diets result in small, weak calves predisposed to disease.

Vitamin A requirement in the final three months of pregnancy rises to 3–5 times the non-pregnant requirement. Low levels of this vitamin are common in diets fed during late winter and calves born at this time of year have a lower resistance to disease. In purchased calves, where adequate reserves of vitamins cannot be guaranteed, an injection or oral dose of Vitamins A and D soon after arrival is a sound practice, particularly in winter and early spring.

Colostrum

The new-born calf is free from bacteria and parasites and has no immunity to disease. The colostrum produced in the first few hours after calving contains about 20 per cent protein, most of which is in the form of antibodies giving immunity against diseases with which the calf comes in contact. The digestive processes of the new-born calf are not developed and this protein is passed from the stomach unchanged, to be absorbed by the intestines directly into the blood stream. This immediately produces a high level of resistance to disease in the young calf which carries it over the first few weeks of life.

The young calf must receive its first feed of colostrum within four hours of birth because: (1) the antibodies in colostrum disappear rapidly, being about half the initial level within ten hours of calving; (2) the calf's intestine soon develops to a point where it is no longer able to absorb undigested proteins; (3) once the calf's digestive processes develop they will break down the proteins, destroying their power to impart resistance, and (4) a reasonable degree of resistance must be built up before the invading bacteria can multiply and swamp it.

Some 9 per cent of all purchased calves have been found to be colostrum deprived; if this is not due to simple negligence on the part of the breeder then other reasons must be found. Where a new-born calf is left to be suckled by its dam it should be seen to do so within a few hours of birth. In periods of extreme cold calves may be too chilled to suck strongly and absorption of colostrum is seriously impaired under such conditions. Poor nutrition of the dry cow, or pre-milking, can each significantly affect the potency of colostrum.

A heifer, a nervous cow, or one with a painful udder or milk fever may not suckle her calf. In these cases the calf must be given colostrum, milked from its own dam or another freshly-calved cow, and fed artificially.

Delivery of purchased calves

Calves should not travel within one hour of their last meal, and should be moved carefully without delay direct to their destination.

Vehicles used for conveying the purchased calves should be clean, warm and airy, though not draughty; this is particularly vital from November onwards.

Treatment of purchased calves on arrival

On arrival the calf should be introduced to a warm, draught-free environment, given a dry bed and allowed a minimum of four hours to settle down before being fed, weighed or handled.

Purchased calves run a greater risk from cross-infection than home-reared animals. Isolation of one individual from another for the first two weeks to prevent direct contact is vital to reduce the spread of enteric infections. Solid-sided individual pens with rails at the front and back are the only satisfactory method of achieving this.

It may also be advisable to give an antibiotic to all purchased calves on arrival. Veterinary advice should be sought on the best drug to use and a full course of 4–5 days at an adequate dosage must be adopted. Vaccines are available for the prevention of E. coli and salmonella infections, but as these usually need to be given at least one week before exposure to infection they present certain practical problems.

Housing

Overstocking, whether practised in or out of doors, leads to a build-up of massive concentration of bacteria or parasites which overpower the calf's resistance to them. Houses and pens should never carry more stock than the number for which they were designed. For young calves in winter extra heat must be supplied to maintain a temperature of 50°F.

Good drainage is essential to prevent discomfort and chilling through the bed becoming soaked, and losing its insulating power. Slatted floors, properly constructed, are the best bed for calves over ten days old and if a straw bed is laid over this it will remain dry and wholesome for a long time.

Individual pens have the added advantage that the ailing calf may be spotted much earlier when not one of a group.

Calf houses should be easy to clean between batches of calves, wooden pens being removable for cleaning by soaking in caustic soda solution and and standing outside to dry off. Ample water with a detergent should be used to remove all dung and waste material from the building before disinfection or fumigation and thorough drying.

Feeding

Anything which interferes with the proper clotting of the milk diet will result in digestive scouring which may lead to infection with *E. coli.*

The capacity of the new-born calf's stomach is between 1 and 2 pints; overfeeding will result in an inadequate curd and excess milk passing into the intestine or rumen where it ferments and sets up irritation. The only method of increasing the daily intake at this age is to increase the number

of feeds per day. Once the calf has become accustomed to bucket feeding the quantity fed at one time may be increased fairly rapidly each day.

Cold milk is quite satisfactory for calves sucking little and often on an *ad lib.* system, but if restricted feeding is practised the milk should reach the calf at a temperature of 104–106°F if it is to be efficiently digested.

A concentration of 1 lb of powder to 6 or 8 pints of water is ideal for calves up to a fortnight old on a good milk substitute; more diluted or stronger concentrations fed for long periods at this age tend to predispose to digestive disorders.

Concentrates of high quality, preferably in the form of a coarse mixture, with as little meal as possible and of even particle size, together with good quality hay, should be introduced at an early age. If pellets are fed they should be rationed or calves may consume them too rapidly. All changes in the diet should be made gradually and diets containing urea or high quantities of barley should never be fed to very young calves.

Enteric disorders or enteritis

Non-infectious enteritis results from the presence in the digestive tract of substances which have an irritating effect on the delicate lining of the organs. This irritation may be caused mechanically by indigestible materials such as sand, or wood shavings, or by the presence of corrosive poisons such as creosote, lead paints, copper and certain poisonous plants; the most common cause in artificially reared calves is the improper digestion of the normal food.

Infectious enteritis is caused by bacteria, coccidia, round worms, fungi and certain viruses.

Bacterial enteritis

The commonest cause of infectious scours in young calves is *escherichia coli.* This may take the form of an acute infection, frequently occurring in the first few hours or days of life, death being so rapid that the animal does not develop diarrhoea, the only symptoms being listlessness and a high temperature.

The more familiar, chronic form, results in the passing of yellowish-brown or greyish-white scour, the animal loses condition and dies after a period of days from dehydration.

Enteritis caused by salmonellae is a less common condition, initiated by an infected animal which may not itself show symptoms. It usually affects calves over two weeks of age and recovered animals must be regarded as carriers of the disease. Salmonella enteritis in home-bred calves may originate from a carrier cow in the herd. Salmonellae can also be introduced by rodents, contaminated food or a human carrier.

Bacterial enteritis may also result from infection with *Fusiformis necrophorus*, the cause of calf diphtheria; and clostridium, causing calf dysentery.

Mycotic gastritis

This condition, caused by fungi, is characterized by ulceration of the stomach, particularly the rumen and omentum. While most common in older cattle, cases have been recorded in young calves, probably resulting from the consumption of mouldy roughages.

Miscellaneous causes

Mucosal disease, colitis and various other forms of enteritis also occur, associated with virus infections which have not as yet been clearly differentiated. They are highly infectious to other calves but occur only sporadically so do not result in excessive losses.

Coccidiosis

This condition usually affects cattle between six weeks and six months of age, the typical symptoms being fluid diarrhoea eventually turning to blood. As the disease progresses the amount of scour passed becomes less and the animal shows signs of abdominal pain and grinds its teeth. Prolonged periods of straining accompany the condition, sometimes resulting in prolapse of the rectum. Cattle develop immunity to coccidiosis and outbreaks in young calves usually result from high stocking rates where age groups are mixed or young calves follow older ones in yards or pastures. Infection is from the consumption of food or water contaminated by infected dung.

This article has been contributed by **J. A. Norman, M.R.C.V.S.,** who is Senior Veterinary Surgeon to R.H.M. Agricultural Research and Advisory Services Ltd. Previous to taking up this appointment he was Veterinary Adviser to a well-known firm of Animal Feed Compounders, following a long period in general practice as a Veterinary Surgeon.

The Ministry's Publications

Since the list published in the April, 1968, issue of *Agriculture* (p. 188) the following publications have been issued.

MAJOR PUBLICATION

Mechanization Leaflet No. 18. Combine Harvesters (New) (Replacing F.M.L.3) 1*s*. 6*d*. (by post 1*s*. 9*d*.)

FREE ISSUES

ADVISORY LEAFLETS

- No. 409. Stem Eelworm on Clover (Revised)
- No. 410. Red Core of Strawberry (Revised)
- No. 450. Perennial Bindweeds (Revised)
- No. 550. Chrysanthemum Leaf Miner (New)
- No. 553. Fertilizers for Cereals (New)

SHORT TERM LEAFLETS

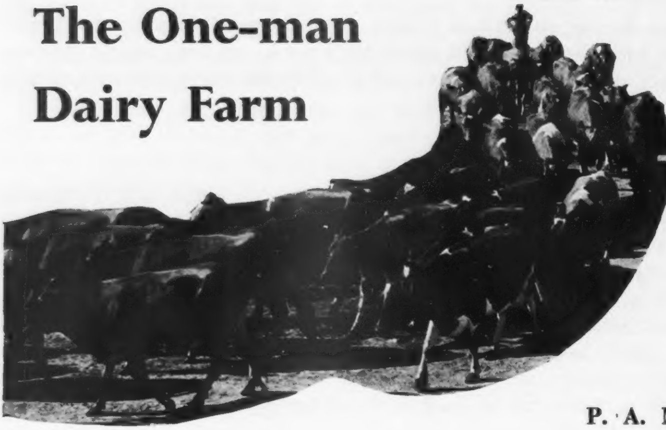
- No. 19. Choosing Selective Weed-killers for use on Cereals in the Spring (Revised)
- No. 29. Choosing Selective Weed-killers for Annual Weeds in Root Crops (Revised)
- No. 52. Suggestions for Chemical Weed Control in Vegetables (Revised)
- No. 64. Control of Botrytis Fruit Rot of Strawberry (Revised) (*Formerly Control of Strawberry Fruit Rot*)
- No. 73. Chemical Weed Control in Onions and Leeks (New)

UNNUMBERED LEAFLET

Take Care When You Spray (Revised)

The priced publication is obtainable from Government Bookshops (addresses on p. 260) *or through any bookseller. Unpriced items, are obtainable only from the Ministry (Publications) Tolcarne Drive, Pinner, Middlesex.*

The One-man Dairy Farm



P. A. Naylor

THE small, family dairy farm with one man as owner-occupier or tenant, together with the main work force and management all rolled into one, is probably the most frequently found dairy farm organization in Britain. The 'one man' is, of course, usually greatly assisted by his wife, and sometimes by elderly parents, other relations or children out of school. The family dairy farms are concentrated largely in the western half of the country, and their contribution to the total milk output is of great significance.

The land that the one-man unit occupies can be anywhere in the range from less than 10 acres to more than 70, and the herd size from under 10 cows to over 50. At the lower end of the acreage and cow numbers, part-time operations are usually the rule, but this still leaves a very large number of full-time dairy farmers who might typically have about 25 cows and followers on about 50 acres. Certainly the small average herd sizes gleaned from statistics support this.

The buildings on the one-man farm are usually modest; a single rank cowshed converted many years ago from a previous use as a barn or stable, a hay barn, boxes, implement shelter and a dwelling-house of uncertain age and condition might complete the picture. The machinery and equipment too is generally simple, ageing though well cared for, based on haymaking as the conservation system with a few tools for cultivation. The milking plant is usually a bucket unit and the surface cooler and can collection are typical of the majority.

In economic terms a careful living for a family can be extracted by dint of hard work and application. The saving feature is usually the low level of fixed costs due to the fact that there are no outgoings for hired labour and only a small investment in equipment.

Such is the typical picture, but having described and understood it we can then regard it as the background only to the upsurge in technical and economic change and development that is beginning to gather momentum. We need not concern ourselves so much with what the one-man dairy farm is, but what it can demonstrably be.

Current developments

Advances in grazing techniques—paddocks with high use, of up to 400 units, of nitrogen—coupled with new ideas on supplementary winter feeding have effectively removed the barrier that a lack of acres used to represent. Reasonably priced forage harvest stores have made control of grass and conservation easier if not more certain. Stocking rates of one cow to the acre with winter bulk feed included are now fairly common; the pioneers have achieved better than this.

New ideas in low-cost equipment, the cow kennel, the package parlour, railway sleepers and P.V.C. sheeting, have lowered the barrier that lack of equipment used to represent. Loaned capital too is perhaps less difficult to obtain now that the development possibilities are known and repayment becomes more certainly planned as farm management techniques improve.

The unit concept

Given that the various pieces of these new developments are carefully chosen and organized, a one-man dairy farmer can build a unit of cows around himself to exploit fully the work that he is prepared to put in, almost irrespective of size of farm or state of existing equipment. The one man is able to handle anything up to 50 cows performing all the tasks on the farm and, exceptionally, to better this. No one pretends that he has it easy, but at least his productivity is greatly increased.

The farm is now in a position to generate sufficient profit to pay off loans and materially improve living standards. A higher level of fixed costs is established, but the extra gross margin will outpace them handsomely and improve the return on tenants' or owner-occupiers' capital. In short, the viability of the business can be much improved.

The man is the key

The developed one-man dairy farmer can use his own labour much more effectively, but he needs the basic skill of good cowmanship for rapid and lasting results. Without the experience and knowledge of the successful handling of cows so that consistently good yields in relation to food use are obtainable, the whole exercise can be a dismal failure. In my view, too much emphasis has been placed on the role of grass obscuring the real skill. Without the ability to turn it into milk, of what avail is an abundance of cheap feed? If devotion to his job and the stock in his care are good omens then the one-man dairy farmer should be succesful; invariably he has these two qualities to a high degree. He has too, the spur of ownership and the possibility of reward to a greater extent than any hired man can have, despite bonuses.

Not least of the possibilities is the success that breeds success. The developed one-man dairy farm is a springboard to further expansion, to increased farm size, multiple units or the development of complementary and supplementary enterprises.

All these things have been demonstrated by the innovators of the new type of organization. Given time to overcome the fear of taking the plunge a great many more will follow, to what sort of future are they committing themselves?

The future for the one-man dairy farm

The boundaries of dairy farming development are beginning to take shape. Technically we may be in for an era of tidying up and small improvements rather than any major breakthrough. What fundamental improvements can take place in cow housing or handling, milking equipment, or grazing techniques that are not already known or forecast? Conservation of the forage crop may be the last to yield its secrets and is the only area of major uncertainty. In this framework the developed one-man dairy farmer has to measure his future against the alternative forms of dairy farm organization that exist or are projected. The yardsticks that count are return to labour (his own) and return to capital. It is very doubtful if he will be easily bettered on either count. The one-man dairy farm should be able to stand comparison with any future alternative organization that is developed irrespective of its scale. Increase in scale, beyond the one-man situation, brings complexity and this can only be overcome either by investment of capital with the need for super efficiency to carry it, or by diversification into multiple units on low cost lines, with the risk of lower margins due to the almost complete delegation of management.

In human terms the one-man dairy farmer may be less well off. The disadvantage of one-man operations is the lack of proper facilities to provide relief for time off, holidays and for sickness. It is true that relief services of sufficient reliability are developing to overcome this. Perhaps co-operative activity amongst units of this type can be developed, after all good neighbourliness has always been a feature of family farm operations. In general, as the viability of the one-man farm improves, why should not the services to him equally improve—the trades, professions, education, advice and marketing.

It is certain that the desire to farm will keep a steady supply of recruits to the ranks of one-man dairy farmers, many of whom see it as their only hope of making a start in farming. They bring with them ability to master the basic skill of cowmanship, a determination to succeed and no inhibitions about using all the help that is available. I think we can look forward to an exciting, if somewhat strenuous, time in the revolution that is overtaking dairy farming; the development of the one-man dairy farm will be a major factor in this.

This article has been contributed by **P. A. Naylor, N.D.A.,** who is County Agricultural Adviser for the N.A.A.S. in Hampshire. He has always taken a considerable interest in farm organization, especially dairying.

European Foul Brood Disease

Beekeepers who suspect that their bees may have come into contact with European foul brood disease last year are asked to get in touch with the local Divisional Office of the Ministry. Similarly, beekeepers who this year send bees on pollination contracts into areas where European foul brood disease occurred last year are advised to notify their Divisional Office as soon as the bees are returned to their home apiary.

Dairy Farming in East Lancashire

F. H. Watson

The pattern of dairy farming in East Lancashire still reflects the influence of the industrial explosion in the area in the late nineteenth century.

Background to farming

In the 450 square miles bounded by Manchester in the south, Pendle Hill in the north, the ridge of the Pennines to the east and Blackburn in the west, live close on one and a half million people. This is the heart of the famous cotton-manufacturing industry of Lancashire. Towns like Burnley, Bolton, Oldham and Rochdale are contained in it. They prosper or are depressed by the fortunes or misfortunes of the textile industry. These industrial towns cluster in the valleys overshadowed by the steep and difficult terrain of the Pennines. On a journey over the 30 miles from Accrington to Manchester it is difficult to realize that in the area of East Lancashire there are about 3,600 farms. The farms are situated on the sides of the valleys often between the 500 ft and 1,000 ft contours. The soil is thin, the slopes severe and inherent fertility levels are low. Rainfall varies between 40 in. and 70 in. with height and situation. This high rainfall and humidity which helped to establish the cotton industry is most unhelpful to farming.

The majority of these farms are between 35 and 50 acres and are normally family farms. The buildings are usually constructed of solid stone, the farmhouse and hay barn being one unit. Stone walls divide the farm into small fields except on the top of the hills where the moor is open.

Why dairying?

Clearly this is not natural dairying country, but nevertheless dairying is by far the most important farming enterprise. This predominance is a result of the industrial background. During the heyday of the cotton industry vast numbers of people settled in the area and there was an immediate demand for fresh milk. Up to that time farming had been based on sheep and wool production. The wool was woven in the farmhouses and sold as cloth. The farm size was small since managing the land was only a part-time occupation. The East Lancashire farmer, always a good businessman, was quick to realize that milk production was likely to pay better than anything else. The producer retailer had arrived.

Retail milk production

For many years milk was brought into the mill towns from the farms in churns and measured out to the housewives direct to waiting jugs. Apart

from the fact that the milk is now delivered in well-marked bottles and the pony and milk float have been replaced by Land Rovers or vans, the pattern is much the same. It is remarkable that well over 50 per cent of the milk producers in East Lancashire are still producer retailers. Together with the similar adjoining area of the West Riding of Yorkshire, this is one of their few remaining strongholds.

Why is producer retailing so important? The hard fact is that on a small dairy farm of about 40 acres it is difficult to make a reasonable living without retailing. Many of these farms can only carry about 20 cows because of inadequate buildings and poor land. The price of retail milk is well above that of wholesale milk, so that where a farmer is prepared to bottle and deliver his own milk, he can effectively increase the value of his sales. This is a hard way of making a living, but it is traditional in the area and the close contact with the consumer is valued. A producer-retailer is, in fact, doing two jobs—producing milk and selling it. It could be argued that the small producer-retailer is still a part-time farmer, as were his ancestors in East Lancashire.

Typical farm

The typical small dairy farm in East Lancashire is a family farm of about 40 acres, carrying about 18–20 milking cows and a few dairy replacements. There is a small intensive poultry unit of about 500 layers. If the farmer is a producer-retailer he will probably sell half of his milk and some eggs to the retail market. The land will, of course, be all grass, and it will be possible to mow about half of it for hay. The remainder is too difficult because of steep slopes and is used for grazing. The buildings will consist of a hay barn, shippon and perhaps one or two loose boxes and lean-to implement shed.

The principle winter feed is hay. Silage-making is not popular because of the labour involved in carting it into shippons in winter. The high rainfall means that haymaking is a risky business and most farmers prefer to leave it until it is well matured so that it dries out more readily. For the same reason there is a reluctance to use high levels of nitrogen for hay, because leafy grass is much more difficult to 'cure'. A good deal of hay is bought-in, particularly from the arable area of south-west Lancashire. There is a growing trend towards barn hay drying as a method of producing better hay, and work at the Great House Experimental Husbandry Farm (situated in the middle of the area) is stimulating interest in the advantage of cutting earlier to increase digestibility.

The annual average of milk yield per cow is between 750 and 800 gallons and the concentrate use about 3½ lb per gallon. The reason for the heavy reliance on concentrates is again the difficulty of making good hay and the fact that the winter is long. Stocking rate is about 1·7 acres per livestock unit.

Economics

From what has been said it can be seen that farm income in general is low. The gross margin without forage costs and including variable costs of retail milk such as bottles, tops, insurance, etc., is likely to be about £100 per cow. The gross margin per acre, including the young stock and after deducting forage costs, will be approximately £55. The overheads or common costs, including rent, machinery costs, family labour and sundries are about £30–£35 per acre if the farmer's own labour is not included. Clearly on a 40-acre farm where the farmer's own labour is charged as a common cost,

A view of Black Lane Ends, Colne, East Lancashire

the farm income disappears. In these circumstances he can only regard his farm income as the return for his own labour. Measures like return on capital invested and amount set aside for reinvestment are meaningless.

Future developments

The main problems are those of farm size and the consequent lack of available capital to increase output. Over the past few years there has been close co-operation between a number of leading farmers and N.A.A.S. advisers in the area who have sat down and looked at these problems together. The main conclusion reached has been that the amalgamation and modernization of these small farms should be encouraged in every way possible if they are to produce a reasonable farm income. Clearly the recent introduction of amalgamation grants is a step in the right direction.

This process of amalgamation has been going on steadily for some time and there are a number of farmers who have increased acreages over a number of years. Often these men have started on small farms as producer retailers and by hard work and business acumen they now have holdings which are capable of producing a reasonable income.

On the bigger farms there is an increasing tendency to install milking parlours and cubicles, although the problems of slurry handling are difficult in high rainfall conditions. A new factor which is emerging on the more intensively-stocked farms where higher nitrogen rates are used is that poaching can become a limiting factor. Grazing techniques need a different approach from the conventional strip grazing or paddocks of the lowlands. The method of zero grazing in spring and autumn if the land is wet is being tried by a few pioneers.

The East Lancashire dairy farmer is extremely hard-working and resourceful and has shown a capacity for survival in difficult conditions. If the size of farms can be increased by amalgamation and the capital is available to make use of the extra acres, then there is no reason why he should not be able to supply milk to the vast industrial population on his doorstep for many years to come, as he has for the last century.

This article has been contributed by **F. H. Watson, B.Sc.(Agric.)**, who is Senior District Agricultural Adviser for the N.A.A.S. in East Lancashire.

Farming Cameo: Series 4

11. Derbyshire

(The Peak District)

John Kingsmill

THE carboniferous limestone country in the Peak District of Derbyshire covers some 100,000 acres and lies on the north-west side of the county. The area is undulating, height between 800 ft and 1,500 ft above Ordnance Datum and is interspersed by deeply cut and attractive dales. Because of its elevation, the area is subject to low temperatures, exposures and a rainfall of 40–50 in. per annum. The average number of snow-lying days is forty which gives some indication of the type of winter experienced in this part of Derbyshire. Late springs are the order of the day, early May being an average time for turning out cattle, but the compensation for this is that there is usually no trouble from summer drought and the autumnal growth of grass is useful.

The average size of farm is 100 acres, rather larger than for Derbyshire as a whole and the livestock enterprises—dairying, cattle rearing and sheep—predominate. The soil is a brown, medium-textured loam, freely-drained, and easily worked. The fact that the limestone is free draining through its natural fissures is one of its best attributes and produces excellent conditions for the grazing animal.

In the past, the area was important for its lead and the history of mining goes back to pre-Roman times. Lead rakes, the results of miners following veins of lead that ran mainly in an east-west direction across the countryside, now scar the landscape although they are grassed over. Much of this 'old men's' waste contains fluorspar and other minerals and is now being worked on an increasing scale. The most important industry in the district is limestone quarrying and the quantity extracted annually now runs into millions of tons. Much of the stone is highly pure, as for example at the Tunstead Quarry near Buxton, where the working deposits contain 98 per cent calcium carbonate. Incidentally, this is the largest quarry in Europe. Naturally, some of the limestone, either ground or in burnt form is used for agricultural purposes, but by far the largest proportion is now used for road making and a variety of industrial and chemical purposes.

Adversity and the pioneering spirit are often found together and this is no less true of the limestone area than any other. Mr. John Furness who farms at Oddo House Farm, Elton, originally a 150-acre farm when purchased by him in 1949, is a good example of the type of man that one meets in this district. Dairying has always been his principal interest, and in order to improve grassland management one of his first ventures was the levelling of some 50 acres of old lead rakes. This work, although expensive, proved highly successful, and first class leys have taken the place of the old hummocky rakes, which had made cutting and fertilizer applications virtually impossible before.

By 1956, the farm acreage had been increased to 240 acres, and Mr. Furness having for some years grown mixed corn with fair results, commenced growing spring barley in a serious way. The limestone soil proved ideal for this crop, and yields of 30–35 hundredweight per acre are average. Barley growing has now spread in the limestone area, and is a useful arable crop in an otherwise pastoral district, although results on land over 1,100 ft O.D. are rather more variable, due to slower ripening and bad harvesting weather. Fortunately, a large proportion of the area is below this contour line.

In 1960, Mr. Furness successfully applied for an Agricultural Research Council grant to try out slatted floors for the dairy cows. The covered yard was sufficiently large to provide both a lying and feeding area for 100–110 cows, concrete slats being used throughout this part of the building. An eight-point herringbone parlour and self-feed silage clamp completed the layout. From the first, the dairy unit was planned so that two men could look after both cows and followers, and this has worked well over the years. Various additions, including the incorporation of cubicles, have been made, but the basic plan has proved satisfactory.

Mr. Furness now has 700 acres under his control. His aim is clear cut—production at the lowest unit cost. This can be seen in his 400-strong Clun and Kerry ewe flock exploiting steep dale sides, in the intensive poultry unit of 12,000 laying hens, and in the way wilted silage for the dairy cows is helping to reduce milk production costs. The future may be uncertain, but careful use of capital has enabled Mr. Furness to build up a strong and resilient farm business.

The photograph on the front cover illustrates the area discussed in this article

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Farming Cameo Series No. 4

Series No. 4 of Farming Cameo which commenced in July, 1967, has, to date, included the following counties or districts:

1. Anglesey (The Isle of)
2. Bedfordshire
3. Berkshire (Vale of the White Horse)
4. Breconshire
5. Buckinghamshire
6. Cambridgeshire (Ely District)
7. Cardiganshire
8. Cornwall
9. Caernarvonshire
10. Cumberland (Whitehaven District)

FROM THE ALS

Good Design for Farm Buildings

F. W. Holder *Agricultural Land Service, London*

UNTIL fairly recently the word 'design' called up visions of effeminate aesthetes, of the Aubrey Beardsley and Yellow Book period; a complete antithesis to the healthy British philistinism which grew up with the Industrial Revolution and has persisted to the present time. This philistinism has manifested itself in many ways, from back-to-back housing, ribbon development, suburbia, sub-utopia and overhead power-lines. Neither town nor country has escaped the spoiler's hand.

It was not until Britons, package-tripping abroad, saw for themselves the regard which most European countries have for urban and rural amenities that there has begun to dawn an awareness of the problem as it exists at home. It is indeed fortunate that we have a Council of Industrial Design which has been set up to encourage British Industry to raise its design standards to sell its goods to the discriminating customers from overseas. The Council was also responsible several years ago, for inserting the first pricks into the rural British conscience, thereby making good design a respectable subject in farming circles.

A distinguished British architect recently estimated that at least 75 per cent of the buildings erected in Britain were not the work of architects or professional designers of any kind. In the sphere of farm buildings, this percentage could probably be put at least ten per cent higher. Whilst very few people, not trained as farmers, would risk their capital in farming without taking skilled advice, the average farmer does not hesitate to design buildings. It is often said that architects cannot design farm buildings. If this is so, it can only be because their services are so seldom invoked, that there is no inducement to make a special study of something which they are not likely to do. It is cold comfort to remind the professional man that he is invariably called in to help when the layman's projects go wrong. It seems inevitable that, in the farming world, all lessons have to be learnt the hard way.

Farm buildings are part of the nation's architectural heritage. They can no longer be regarded as mellowed evidence of a way of life; they are part of a continually expanding industry, essential to the well-being of the nation and therefore to be regarded, in terms of building, like any other industry which has grown up in the last twenty-five years. The farm building of today is just as much a factory as its industrial counterpart, and must be accepted into the rural environment as such and not disguised to look like something which it is not.

Good design is a combination of factors, none of which, by themselves, will produce a satisfactory answer. Among the most important, are the following:

Planning

This means fitness for purpose, functional, large enough for initial needs and capable of expansion if necessary to meet future demands. It means using the terrain to the best advantage and the services and means of access available. It involves knowledge of planning and design techniques and an understanding of the client's requirements. A diploma in agriculture is not necessary to a farm building designer. What is desirable is the precious gift of being able to give the client, not what he wanted, but what he would have asked for if he had only known what he needed!

Construction

A building, however well planned on a horizontal plane, is no good if it leaks or refuses to stand up. The construction must be of a kind suitable to withstand the onslaughts of the elements from without and the occupants from within. Environmental needs will also play an important part in determining the way it is to be built. One hears much talk about short-life and (by implication), low-cost buildings. But on a farm, especially where rough usage is the order of the day and maintenance an infrequent occurrence, it is essential that buildings shall be of sufficient strength not only to last as long as required but also to perform their functions efficiently. In effect, a cattle building designed to last ten years, as often as not, has to be constructed in the same fashion as one intended to remain for 60 years.

Appearance

This is the basis of final judgment, which is in the eye of the beholder. A building which has passed this test will sit in the landscape as if it has grown out of the land, instead of being dropped on it from above (and how often this appears to have been the case!) it will harmonize with existing buildings in outline as well as in tone; it will, in scale, express its function and, in its detailing, avoid crudity.

Most of today's farm buildings have, in their construction, an element of prefabrication to a greater or lesser degree, and so their design is not always a matter of individual taste, so much as a problem of selecting ready-made components and assembling them in an intelligent and knowledgeable manner. Steel, conrete and timber constructional frames generally form the skeleton, upon which a variety of claddings can be hung; the choice depending, again, on the building's function. Certain materials, for example asbestos cement sheets, have, over the years, become accepted in the vocabulary of the industrial building designer, and a building so clad is instantly recognized for what it is.

If money were no object, it would be pleasant to think of stone and mellow facing bricks, tiles and slates, as providing both protection from weather and respect for local amenity. These materials today, if not wholly unsuitable to modern farm building needs, are often too expensive to be used in a liberal fashion. In areas of scenic beauty or National Parks, some concessions to tradition may be required, but in general the skilled designer must compromise with old and new materials so as to get the best from both.

One of the claims advanced by the protagonists of 'industrialized' buildings is that they will, if adopted, improve the design of farm buildings beyond the range of crticism. The fallacy in this argument is that if the designer of the industrialized building is not himself of the highest calibre, then its adoption presents no advantage, especially if, as is so often the case, it is more costly than traditional building. The range of factory-made components is constantly widening but except in the field of specialist buildings, such as poultry, pig and calf houses, there seems to be no particular virtue, other than a purely academic one, in a wholly industrialized system of construction.

Any consideration of design invokes thoughts of colour and many fanciful suggestions have been put forward for making farm buildings 'blend' with the landscape; in other words to camouflage them so as to conceal their presence. If a building is well designed it is worth looking at, if it is not, it should never have been built at all!

Building in the open countryside, where colours change with the seasons and the weather, presents the designer with a difficult problem in preserving amenity. The traditional building materials of the past had 'built-in' colour deriving from the earth; their place of origin and therefore good manners in design came without conscious effort.

Modern building materials of the kind most commonly used in farming are national, rather than regional, in colour and texture. Certain colours, especially some greens, whilst purporting to harmonize with foliage, do so for relatively short periods of the year. The rest of the time they look disturbing and incongruous. In the writer's opinion, red ochre and black, expertly used, are the most effective of all the colours which can be set against a rural background.

However, applied colour tends to wear off, giving a worse appearance than if it had never been used. The cost of maintenance and repair work these days is high, and therefore good appearance must rely on tone and texture, for its effect. Light and shade, provided by differing profiles of cladding used in juxtaposition, can give a tonal effect which in itself provides colour, and the use of reflecting material, such as aluminium, can bring earth, sky and woodland into the building complex.

Design is not simply a matter of icing the cake. If the ingredients are bad, no amount of adornment will make it palatable. It is the art of visualizing and working in three dimensions, allied to experience in the matter of construction and materials, which decides success or failure.

Cost

A building is an important thing in its owner's eyes. Often it is the one big expenditure of his life and he wants to be sure he is getting value for money. If he were investing capital he would seek the advice of a broker; when he sinks his money in bricks and mortar it would be prudent also to take professional advice, this time of an architect or surveyor.

Except in those cases where particular amenity considerations call for special materials or treatment, above what would normally be required, good design costs no more than bad; often less, when it comes to correcting errors in a badly designed scheme.

Slums are not a monopoly of cities. They exist too, in the countryside, though at less frequent intervals. Good design will keep them from spreading.

in brief

- **The labour force**
- **Egg size**
- **Biological control research**

The labour force

AN integrated feature of the philosophy of productivity which now governs the structure of Britain's farming is the steadily diminishing size of its labour force. Whereas immediately after the end of World War II the labour force of this country, excluding the Women's Land Army and prisoners of war, numbered 668,000, the corresponding figure taken at June, 1965, was 450,000—a reduction of over 30 per cent. The horse has gone the way of the ox, and the number of tractors (only a single facet of mechanization) now substantially exceeds the number of regular whole-time farm workers.

In 1946, apart from the farmer and his wife, the number of regular whole-time workers was over half a million, served by 430,000 farm horses and a mere 150,000 tractors. The peak year was 1949, when regular whole-time workers totalled 591,000. Since then the size of this force has continued to decline every year at an average rate of 3·6 per cent to its latest (1965) figure of 313,000. The fall was particularly marked in the four years 1961–65, when it reached an annual average of nearly 5 per cent, and this notwithstanding the slackened rate of mechanization in that period. The number of tractors had remained almost static following the steep rise in 1953–58, although combines and other harvesting machinery continued to increase in numbers during 1961–65 and tractors were tending to become larger and more powerful.

The official report* from which these figures are drawn also shows how varied is the composition which, for the sake of convenience, is embraced by the term 'labour force'. It covers both the farming and the horticultural fields, with their greatly differing techniques and skills, men, women, youths and girls, regular whole-time workers, regular part-timers, seasonal and temporary workers. Most of these are hired workers, not related to the farmer, but others are partners and family workers, some paid and some unpaid. The farmer and his wife, who on many a small farm may be the only workers for the greater part of the year, are, generally speaking, excluded from the present analysis. Fifty-four per cent of the 306,000 holdings in England and Wales were recorded in the June, 1965, Agricultural Census as employing no workers, and although many of these are small part-time holdings, their occupiers' manual work account in the words of the Report for 'a sizeable part of the total labour input in agriculture'.

Viewing the country overall, it is seen that the exodus from farming is more pronounced in those areas adjacent to light industrial competition in the South and Midlands. The bigger farms are losing men fastest, but it is from the small farms (still the predominating feature of our agricultural structure) that the highest percentage loss occurs.

The full story in this 100-page Report, which is largely derived from the Ministry's Wages and Employment Enquiry instituted in 1945, also covers the hours of farm work and weekly earnings. It is a document that will pass into history, but it also has important implications in this present time of transition.

**The Changing Structure of the Agricultural Labour Force in England and Wales*, price 17*s*.6*d*. Copies are obtainable from the Ministry of Agriculture, Fisheries and Food, Tolcarne Drive, Pinner, Middlesex.

Egg size

Whilst egg size is obviously an income-promoting factor, it is one which should be kept in its proper perspective. The performance of hybrids (notably some brown egg strains) laying a high proportion of large eggs may be impressive, but an analysis of costings may well reveal the total production of eggs to be low and the profit correspondingly reduced. This is the view of Harry C. Whelden, Jr. of the University of Maine, where this essentially commercial aspect of the poultry business has been under investigation. In assessing overall profitability, he places egg size fifth in a scale of importance, subordinate to egg price, egg numbers, feed efficiency and liveability, in that order.

Many factors may affect the size of eggs. Breeding alone does not control it, as is still thought in some quarters. Only 35–40 per cent of the variations in egg size can be attributed to breeding and heredity; the remaining 60–65 per cent is due to differences in environmental factors understood in the widest sense. Notwithstanding the fact that some strains will generally tend to lay smaller eggs than others, it would be possible by so changing environment to get large egg strains to lay much smaller eggs than the so-called small egg strains. Body size is also closely related to egg size, thus earlier maturing birds are lighter when they come into lay, and birds that are smaller than normal will tend to lay smaller eggs.

Time of hatching is another influence. For example, if birds are coming into lay when natural day-length is increasing, they tend to mature earlier and lay smaller eggs; if they are coming into production when natural daylight is decreasing maturity is delayed and initial egg size is larger.

Dealing with the purely environmental side, Mr. Whelden emphasizes the importance of sound and adequate nutrition, fully accepted, to maintain egg size—in particular it is necessary to see that energy intake is not for any reason below the birds' needs, and that the protein level is also adequate. The American experiments have shown that a ration containing much less than 15 per cent protein may result in a drop in egg size or an improper protein-calorie balance. It is possible, says Mr. Whelden, that the protein influence on egg size is actually an amino acid effect; adding certain amino acids to feeds containing 12–14 per cent protein gave an increase in egg size.

Adequate water consumption is essential both for egg size and good overall production, and as temperature increases this factor becomes more and more important. One of the first things to look for in a flock with poor egg size is insufficient or dirty water. If, says Mr. Whelden, the poultryman feels that his present strain is not giving a satisfactory egg size, it is suggested that (disease apart) he first ascertains whether his watering programme is adequate, followed by a check of the other environmental factors, any or all of which might be contributing to the problem. As a last resort, and after he is sure that none of them is the cause of poor egg size, then he might consider changing to strains that have demonstrated their ability to give larger eggs than his present birds.

The point that birds kept in cages usually lay larger eggs than those kept on litter is interesting, although the reason for this is not clear.

Biological control research

A grant of £2,350 which the Natural Environment Research Council has made to the Soil Association for research into the biological control of insect pests is a further important step extending the front along which the predators of man's food can be attacked. This project, to be carried out on the Association's 200 acre farm at Haughley, Suffolk, will be under the control of Dr. Kenneth Mellanby, Chairman of the Research Advisory Committee of the Soil Association and Director of the Nature Conservancy's Monks Wood Experimental Station. The chief investigator will be Mr. R. W. Paine, who has a world-wide reputation in this sphere. The careful analysis of the results of this piece of research will, we may depend, extend our knowledge on to an extremely interesting plain.

AGRIC

Books

Forestry in the English Landscape. Roger Miles. Faber and Faber, 1967. £5 5*s*.

Here is a finely produced, beautifully illustrated and well-documented account of a topic of growing importance to every landowner—the place of trees, woods and forests in the landscape. The author, who is qualified in both forestry and landscape architecture, has a strong sense of history. He traces the planting movement from the days of John Evelyn, 1620–1706, to the recent expansion of the Forestry Commission, and the legal powers of tree preservation embodied in the Town and Country Planning Acts.

Englishmen feel strongly about trees, whether they are to be planted or cut down! They live amid man-made surroundings. As soon as their forbears had cleared forests to till fields or build cities, they perversely insisted on setting up trees along every hedgerow and in every town square. During the eighteenth century formal designs were the rule—in the countryside as well as in the towns—and straight avenues of regular trees, often a mile or more in length, were accepted. Today, we want our woods to look natural, and to blend into their surroundings as though they had sprung, unaided, from the soil.

Roughly half this book is sensibly devoted to a regional study in which the author has played a leading part: the afforestation survey of the Exmoor National Park in Devon and Somerset. Here there is a conflict of land use, between the profitable planting of conifers on poor moorland that holds few attractions for the farmer, and public enjoyment of a marvellous open upland bordering the Bristol Channel. Roger Miles shows, by imaginative sketches, how a sensitive study of the terrain, combined with the judicious retention or new planting of broad-leaved trees, can preserve the amenities that delight the tourist. At the same time timber production and its associated local employment can flourish.

Encouraged by grants from the Forestry Commission and also, where shelter-belts are concerned, from the Ministry of Agriculture, landowners are now planting woodlands at the highest rate ever recorded. Their 35,000 acres a year approaches the 50,000 acres that the Forestry Commission achieves under its own direct planting schemes. At the same time increasing leisure, and a growing horde of motor cars, enable more people than ever to visit and view the forests and woodlands. Misjudged planting can mar a landscape for a hundred years. But good design, such as we see in the plantations now being established along new motorways by the Ministry of Transport, provides a scenic asset for generations of future travellers to admire. This author's happy blend of meticulous investigation and deep feeling for the beauty of moor and dale, wood and watercourse, have resulted in a reliable guide for every future planter of trees that will influence the English scene.

H.L.E.

Digging Stick to Rotary Hoe. Frances Wheelhouse. Cassell, 1967. 50*s*.

This interestingly written and well illustrated book is concerned with the development of agricultural implements and machinery in Australia where the early settlers were faced with conditions utterly different from those of Europe. A new country, with new problems, demanded new ideas: untried methods of tillage and harvesting had to be devised to make a living or even subsist.

Whatever qualities the early pioneers in Australia lacked, the ability to invent was not one of them. An early example of Australian ingenuity in tillage implement design was the stump jump plough invented by Robert Bower Smith in 1876. Conventional ploughs would not stand up to the task set in the early days of ploughing land that was recently forest. What was needed was a plough share which would ride over tree stumps and reset itself as soon as the obstacle was surmounted. In Smith's plough the rise and fall of the share was controlled by a 56 lb weight on one arm of a compound lever attached to the share, the 'give' of the share being altered according to working conditions by moving the weight along the lever.

Smith constructed a single and a 3-furrow plough on this principle with the help of his blacksmith brother who, the author notes, was little impressed by the device. Nevertheless, the invention largely contributed to the taking up within a period of three years of half a million acres of land by settlers. In spite of patenting there were

many counter claims from improvers and adaptors of the stump jump plough. There is some wry satisfaction in learning that for an invention that made a major contribution to world tillage Smith was eventually given £500, a gold medal and one square mile of Australia! In contemporary times his ploughs, fitted with disc cultivators, were exported to the U.S.A., where they were widely used to handle scrubland in the western states.

Mr. Wheelhouse has included several eye-witness accounts of the testing and demonstration of prototype implements and machines. Often the inventors were physically abused, and the determination and toughness of many of them is made abundantly clear.

Many Australian inventions have gained world-wide acceptance in agriculture: they include McKay's stripper-harvester (1884) which stripped, threshed, cleaned and bagged corn in one operation; Quinlivan's four-wheel drive; Bottrill's 'road wheel' which embodied the principle of the caterpillar tractor; one of the earliest combine drills; the bulk handling of grain and the first practical sheep shearing machine invented by Wolseley. It was he, incidentally, who constructed the first Wolseley autocar with H. Austin in his sheep shearer factory in Birmingham, U.K. During 1920 A. C. Howard in N.S.W. invented the rotary hoe.

A.J.L.L.

Pigeons and People. George Ordish and Pearl Binder. Dennis Dobson, 1967. 21*s*.

Anyone who has stood in Trafalgar Square will appreciate that at least some people are fascinated by pigeons. The more perceptive observer will also have noted that pigeons soon learn to recognize those members of the human race who present them with food. While it may be anthropomorphic to suggest that pigeons are fascinated by people, as the publisher's blurb states, it is clear that the relationship can sometimes be rewarding to both parties. This is the background theme against which the authors have set out to investigate a subject which seemingly should appeal to all concerned with the economic problems posed by *Columba livia*.

The style of the book is purposely humorous and flippant, but well suited to the presentation of what seem a wealth of bright ideas. But this surface veneer is thin and the informed reader soon detects that these are revamped and that the authors owe an inadequately acknowledged debt to serious students of the subject. Admittedly, they begin by acknowledging some of Goodwin's original contributions, but fail to point out that their diagrams on pages 16 and 17 are appallingly bad copies of the same author's work published in the Avicultural Magazine (1954, 40: 190–213). This might be excused, but in spite of the fact that at least a score of workers in Britain are making serious studies of the species (and results have been published), the authors open with the statement—'Yet one of the commonest birds (i.e., the feral pigeon) . . . is hardly studied or watched systematically at all'. Presumably, this statement is intended to imply that much of the remaining book depends on the author's own observations and original thoughts.

The number of misquotes and misinterpretations is incredible and far too numerous to list. 'In a town near a sea-shore with good cliffs there is likely to be a large colony of wild rock doves . . .'. As genuinely wild rock doves are now rare and virtually confined to N.W. Scotland this is blatantly misleading. 'The pigeon is not very territory-conscious'—completely untrue, quite apart from the unfortunate implication of conceptual ability; but emotive language is a feature of the prose. The classical description of pigeon behaviour depends on O. and K. Heinroth whose original German text has been mistranslated and telescoped, it must be at secondhand, to the extent that when the nest-calling display of the male pigeon is rendered he 'calls to the nest'. Just what can one say to 'The female remains in a fertile state for ten days (this is untrue); she starts feeling lustful earlier than the male and the period lasts a little longer'. A superb mistranslation of the Heinroth's original text is rendered 'In widowhood the sexes keep themselves apart'.

The chapter dealing with control does little more than quote Ministry of Agriculture research published seven years ago. Even then, it fails to make it clear that nicotine was only tested in the laboratory and it is quite unjustified to draw the conclusion that 'pigeons appear to be more sensitive to tobacco than mankind'. In pointing out that there would be no feral pigeon problem if people stopped feeding the birds, the authors conclude 'In short feral pigeons we repeat, are a luxury for wealthy food-rich nations—the 'haves'. They should see the wild pigeons swarming in the towns and villages of India to appreciate the puerility of such phrases. This, then is not a book to be read by anyone wishing to learn about untamed pigeons—but it is

amusing if regarded as an ornithological *1066 and all that*.

R.K.M.

Animal Anatomy. A. VOYSEY. Evans Brothers, 1967. 11*s*. 6*d*.

The author has long and wide experience of presenting the principles of agricultural sciences to young entrants to the industry, such as members of Young Farmers' Clubs; he has made notable contributions to agricultural education in the broadest sense. Here, he has set out to provide for stockmen basic knowledge of animal anatomy and physiology so that they may appreciate better the reasons for what they do in day-to-day animal management. His method is to give concise descriptions of the several systems including digestion, circulation, respiration, reproduction, etc., first for mammals, and then for the fowl. The text is profusely illustrated by excellent line drawings and diagrams indicating the main organs and processes involved, supported by many photographs. The result is a lavish publication, but of problematic impact.

The essential aim is sound, but 'stockmen' are nowadays of all ages and of very variable experience, education and aptitudes. The short, curt answer to a question is not generally acceptable; though at lower levels of tests for 'qualifications' it may get by, at higher levels or with more experience, it is inadequate. It would seem that the author, trying to cover a wide range of readers, has failed to give any one group a satisfactory reference book. It should be in the libraries of farm institutes and agricultural centres, but not necessarily in the hands of all students.

Many useful cross references are included in the text, which do not always clarify. Some typographical errors are irksome: 'nucleii' on pp. 8 and 45. Some statements are not properly informative; e.g., on p. 21, new red cells and white cells are formed in the marrow of some of the bones—which? There is a combined index and glossary, a suitable device in a book of this sort, provided it works. 'Agglutinins' are named on p. 21—'see glossary'—but are not in it; under 'Fallopian tube' there is the irrelevant note that the name derives from a sixteenth century Italian physician.

There is a definite need for an introductory text of this sort; perhaps a second edition of this, with clearer objectives, and different, more compact, format, could meet it.

J.E.N.

Beef Handbook No. 1. BEEF RECORDING ASSOCIATION, 1967 4*s*. 6*d*. (including postage).

Any farmer interested in taking a new look at his potential for beef production cannot fail to be attracted by the new series of booklets which the Beef Recording Association is publishing on behalf of the Joint Beef Production Committee. The first of these examines in detail an intensive grassland system using autumn-born calves from the dairy herd, and embodies the physical and financial records which have been made available from the Grassland Research Institute at Hurley and other research and experimental farms.

The aim of this system, which has shown high gross margins, is to get the animals averaging a daily liveweight gain per head of at least 1·8 lb to hit a slaughter-weight target of 850–1,150 lb liveweight at ages from 14 to 19 months. Variations of the system as regards breed, sex, month of birth, age and weight of the cattle at slaughter and of feeding and management of housed and grazed cattle are discussed, so giving the greatest practical help to farmers in the adoption of the particular enterprise most likely to succeed under their individual circumstances.

Copies of this book are obtainable only from the Beef Recording Association (U.K.) Ltd., 55 Minster Street, Reading, Berks. The second book in the series will deal with Intensive Cereal Beef Production.

S.R.O'H.

The Daffodil and Tulip Year Book, 1968. Royal Horticultural Society. 21*s*. (by post 24*s*.).

Once again the Royal Horticultural Society have prepared their collection of nearly fifty short articles covering records, news and musings—all concerning daffodils and tulips.

A valuable contribution for botanists and collectors is the up-to-date key to the genus *Narcissus*, from Professor Fernandes of Coimbra University, Portugal. There is also an account of some tulip species collected in Iran and Afghanistan. Professor Unver of Istanbul discusses a little known aspect of narcissus history, cultivation in Turkey, especially in the eighteenth century.

The solid worth of these contributions does not prevent the greater portion of the volume being devoted to present day exhibition daffodils. As a New Zealand contributor mentions, England is regarded

as the hub of the daffodil world. Yet there is a dearth of raisers here today and a wistful note creeps into some accounts of 1967 shows, suggesting that 'the kings have departed'. Significantly it is the late Guy Wilson's white trumpet 'Panache' that is described as the daffodil of the year.

An international flavour is maintained with accounts of daffodil shows in the United States, Australia and New Zealand and by the dedication of this issue to Matthew Zandbergen, friend of daffodil growers the world over.

If some of the general articles tend to nostalgia, commercial developments are revolutionary. Workers at Rosewarne Experimental Horticultural Station describe new packing methods devised to meet the stringencies of modern marketing conditions. With the tightening up of safety precautions in this country it is odd to read of the dangerous 'chemicals' apparently being used freely in Ireland.

Data on awards and registrations are duly recorded. The illustrations, seven coloured and forty-two black-and-white, are again of exceptionally high standard.

K.H.J.

Pesticides and Pollution. KENNETH MELLANBY. Collins, 1967. 30*s*.

For their fiftieth publication the New Naturalist series have chosen a book which may be considered a milestone in the years to come. This account of what we are doing to our surroundings may be seen as a turning point in our approach to this problem. It is commendable that, for the first time, our environment is shown to be subject to all manner of pollution and that the elimination of any one source will serve only to accentuate the remainder.

On most counts it is clear that little direct harm has been done to the wild life around us. In the case of radiation hazards credit is given for restricting what would otherwise be a serious pollutant. Several other topics, such as ocean and shore pollution, are carefully examined and the slight risks described. Although great care is taken to point out that we know little about some of the hazards, the few figures given on water pollution and the photographs of human lung tissue, with respect to air pollution, demonstrates the seriousness of the situation with which we are faced.

Dr. Mellanby deals admirably with the topic of agricultural chemicals. He finds little to disturb us in the use of herbicides, fungicides and most insecticides. Perhaps this is intentional for when he eventually describes the effects of the persistent organo-chlorine insecticides, one is horrified by the devastation caused and our apparent inability to see the end effects of the means we use to produce food. That we have nearly exterminated such species as the peregrine falcon and the sparrow hawk, and have even threatened the golden eagle, is an indictment we shall not easily live down.

In any treatise on so complex a subject it is not difficult to find some faults. Whilst it is not a book for the specialist, the layman might be entitled to complain that too many facts are taken for granted and not explained adequately. Some effort could well have been made to define the phrase 'wild life' and to give some idea of where the main types of mammal, bird or plant are at risk. The author is also rather brief when it comes to the effects of agriculture itself; which has a very direct effect on all living objects by the destruction of suitable habitats. By comparison the use of chemicals has done less harm. Set against this he gives due credit to the part played by game preservation and the value of enlightened gamekeepers and farmers.

This book has been lucidly written and Dr. Mellanby has handled an emotional and far-reaching subject with considerable care and skill. It deserves to be read by all enlightened people as its message is both clear and disturbing.

R.J.M.

A Survey of the Agriculture of Hertfordshire. (County Agriculture Surveys No. 5). H. W. GARDNER. John Murray, 1967. 30*s*.

Here is another book in the series designed eventually to cover all the English counties. The author, who was on the staff of the County Farm Institute at Oaklands St. Albans for some forty years, has an incomparable knowledge of the soils and farming in Hertfordshire because, in addition to teaching, he found time to get out and study soil problems and farming systems.

While the required object of the survey may have been an up-to-date report on farming in the county, and this is achieved very comprehensively, the fascination of the book lies in its references to past history in relation to modern practice. For instance, in an appendix, there is a record of the dates of harvesting on one

farm from 1850 to 1963 together with notes on yields, prices, labour and equipment over the period. The inevitable statistics are dealt with in a most interesting way and another valuable appendix is a detailed soil map of the county.

H. V. Garner, late of Rothamsted, was contemporary with the author and, after reading the final proof, wrote to him as follows: 'When we started our course in agriculture in Cambridge just after the first World War, we were advised to read Hall and Russell's *The Agriculture and Soils of Kent, Surrey and Sussex*. If in future any student commencing agricultural studies in any part of the country asks for my advice it will be to read the "Herts" Survey'! I fully endorse this advice and would add that the book should have equal value for historians, archivists and all those who have any interest in farming in Hertfordshire.

Appropriately the foreword is by Sir Harold Sanders, formerly Executive Officer to the Hertfordshire War Agricultural Executive Committee and, more recently, Chief Scientific Adviser to the Minister of Agriculture.

J.C.M.B.

Modern Agriculture and Rural Planning. JOHN WELLER. The Architectural Press, 1968. 63*s*.

The author has set himself a difficult task by attempting to deal with two very large subjects in one book. It is true that the subjects have some common ground but there is so much to be said about both, that there is a distinct possibility that the reader will be unable to absorb it all. This is regrettable, especially at the present time when it is absolutely essential that the man in the street grasps the facts about the pressures on the countryside and the importance to the nation of food produced from, and in, that countryside.

Mr. Weller's book is full of facts, figures, quotations, illustrations and some intelligent crystal-ball predictions. Those who are involved in modern agriculture or rural planning will find the volume a valuable reference book. Despite the wealth of detail, very few solutions, remedies or answers are suggested. Perhaps Mr. Weller's contribution to the problem of rural planning is not to provide answers but to survey the scene and indicate the dangers. There is no doubt at all that his work does this very convincingly.

P.J.H.

Man and Environment. ROBERT ARVILL. Penguin Books, 1967. 8*s*. 6*d*.

This book presents the general facts in a clear and readable form, basic to a proper understanding of the planning problems which face us in the years ahead. Coverage of such a wide field has, however, as the author acknowledges, led to some over-simplification and omissions in the various sections, which will soon be apparent to specialists in those fields. These defects can be readily excused in such a wide-ranging survey of the many inter-related planning problems which will have to be resolved if we are to achieve a high-quality environment.

The book may be conveniently divided into seven parts. The first, which reviews our land resources and the pressing need to conserve and develop them, is followed by chapters on air pollution, water resources, wild life, unities—which illustrate the varying interactions between land, water and living things—population and the aims, problems and achievements of planning. The final section debates how planning might be placed on a firmer long-term footing, including discussion of matters such as land ownership, zoning and environment standards.

Mr. Arvill makes it abundantly clear that satisfactory conservation and development of our nature resources requires careful planning and can only be achieved if all human activities are taken into account. He emphasizes that these are matters from which we, as individuals, cannot stand aside. We owe it to posterity to take a personal interest in the conservation of our national heritage.

D.J.G.

books received

Rural Settlement and Land Use. (2nd (Revised) Edition). Michael Chisholm. Hutchinson, 1968. 10*s*. 6*d*.

Pine Martens. Forestry Commission: Forest Record No. 64. H. G. Hurrell. H.M.S.O. 1968. 2*s*. 6*d*.

Farm Business Statistics for South East England. Supplement for 1968. Copies from Dept. of Agricultural Economics, Wye College (University of London), Ashford, Kent. 4*s*. 6*d*.

Annual Report 1967. The National Farmers' Union.

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SULPHUR
Colloidal and Wettable Formulations
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CORRECTION TO 1968 LIST

P. 92—Under the heading ETHION the name of the product should read 'Embathion' and not 'Embathion Seed Dressing.'

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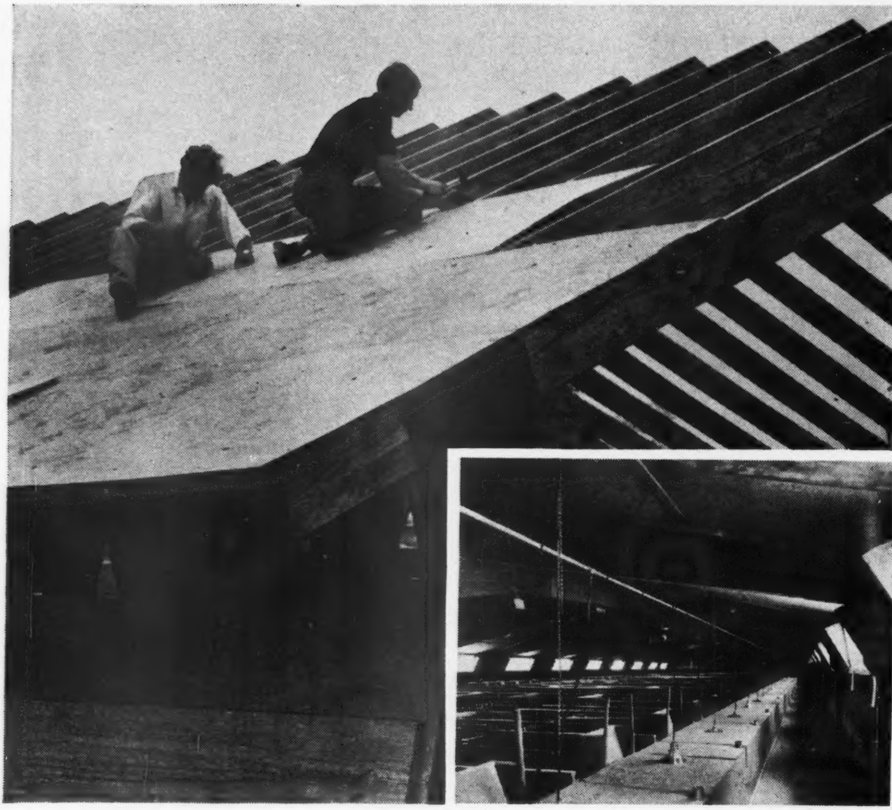

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